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BRITAIN'S BEST-SELLING MICRO WEEKLY

News Desk

Software piracy — tapes seized

POLICE in Salford have charged two men with offences in connection with video game piracy

Over 13,000 copied tapes were seized by police from a Salford warehouse two weeks ago — versions of top selling titles from Psion, Quicksilva, Ocean Ultimate, Imagine and Durrell

The two men Donald Freeman and Stuart Caulfield Aspell, have been charged with criminal deception Pirated copies of 10 Spectrum games have been discovered after Ocean reported the discovery of a pirated copy of its *Kong* game All of the titles were professionally produced copies with full-colour cassette inserts hardly distinguishable from the originals. Among the other titles involved were *Flight Simulation* from Psion *Boogaboo* from Quicksilva *Schizoids* from Imagine *Hornet Attack* from Durrell and *Atic Atac* from Ultimate

One of the distinguishing features of the copies was the type of cassette used Rather than being of the welded type the cassettes were of the screw-type, probably of Spanish origin

As well as being charged with criminal deception, the two accused individuals have been charged with violation of the 1956 Copyright Act Freeman has appeared in court and

continued on page 5

Acorn 6502 second processor

ACORN has finally announced the first of its second processor options for the BBC machine — the units have been on display at shows for over a year

The 6502 second processor which Acorn says is available now, costs £199 and gives the BBC owner a second 6502 processor and an additional 64K of memory

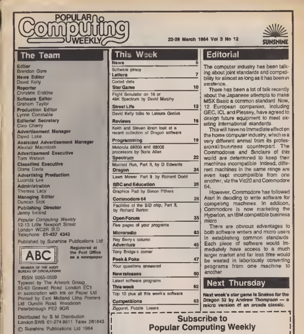
The unit plugs into the tube

continued on page 5



This Week


ORIC (16&48K) TANDY COLOUR (16K)
DRAGON 32
SKRAMBLE
ORIC 48 K
ORIC £5.50 DRAGON 32 £8
TANDY COLOUR £8
MICRODEAL 1984



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Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work

This Week

Editorial

The computer industry has been talking about joint standards and compatibility for almost as long as it has been in existence

There has been a lot of talk recently about the Japanese attempts to make MSX Basic a common standard Now, 12 European companies, including GEC, ICL and Plessey, have agreed to design future equipment to meet existing international standards

This will have no immediate effect on the home computer industry, which is a very different animal from its professional/business counterpart The Commodores and Sinclairs of this world are determined to keep their machines incompatible Indeed, different machines in the same range are even kept incompatible from one another, viz the Vic20 and Commodore 64.

However, Commodore has followed Atari in deciding to write software for competing machines In addition, Commodore is now marketing the Hyperion, an IBM compatible business micro

There are obvious advantages to both software writers and micro users in establishing common standards Each piece of software would immediately have access to a much larger market and far less time would be wasted in laboriously converting programs from one machine to another

Next Thursday

Next week's star game is Snakes for the Dragon 32 by Andrew Thompson — a micro version of an arcade classic.

2nd Processor

◄ continued from page 1

high-speed data bus interface on the BBC machine Most programs will run up to 50 percent faster with the second processor connected The program is run on the second processor leaving the 6502 in the BBC itself to simultaneously handle the screen display, Basic operating system, keyboard, sound and input/output calls With the 6502 second processor connected, the BBC machine has 60K of contiguous programming space — including 44K available to Basic — regardless of display mode

Acorn plans to follow the 6502 unit with the Z80 second processor in June The Z80 will be offered complete with CP/M operating systems disc and software

Bad news, however for those looking forward to Acorn's third second processor option — the 16-bit National Semiconductor 16032 device. This option has receded still further and is unlikely to appear this year Chip availability problems have been blamed, although Acorn says it is determined to continue with development of the product

To complement the launch of the 6502 option, Acorn has announced a development of the Robocom computer aided design software package originally developed for the Apple The system has been considerably enhanced and is implemented on the BBC with twin-disc drive and 6502 processor system using the Bitstick — a kind of glorified joystick

The sophistication of the Bitstick graphics system is matched by the sophistication of its price — £375

Video nasties' Bill to cover micros

THE scope of a Bill being debated by Parliament designed to curb so-called 'video nasties' has been extended to cover video games

The Video Recordings Bill — if passed, which seems almost certain — will mean that home computer games will have to be classified in much the same way as films are at present A system of certificates would be imposed, limiting purchase of some games only to those aged over 18 and banning others

Tory MP Graham Bright introducing the amendment to his Bill drew attention to TV games showing scenes of sex and violence In particular, he singled out the *Ship of Doom* adventure by Artic which includes a rape sequence A further change due for introduction when the Bill reaches the Lords will extend its powers to include Rom cartridge software as well as tape and disc material

Under the terms of the Video Recordings Bill, fines of up to £20 000 could be imposed on individuals dealing in unclassified video game 'nasties'

The Bill, which could become law before the end of the year, would have a far-reaching effect on the software industry Every program, before it could be published would have to be submitted to a group similar to the present British Board of Film Censors

Tape piracy

◄ continued from page 1

been released on £10 000 bail Aspell was due to appear in court on Monday March 19

The arrests are a further indication if any were needed that commercial software piracy is now big business

Doppelgangers

BUG-BYTE is not a company to give up without a fight

Having lost its top-selling *Manic Miner* Spectrum program to Software Projects, it now plans a version of the game for the Commodore 64 — *Mattie Goes Mining*

The legal position surrounding the Bug Byte/Software Projects *Manic Miner* dispute has also been complicated still further — Bug Byte has trademarked the name *Manic Miner* while Software Projects retains the copyright to the game

Aligator's Blagger

Bug-Byte's *Mattie Goes Mining* will not be the only game on the Commodore 64 to develop ideas used in *Manic Miner* — itself a distant relative of *Miner '49er* from the arcades As well as Software Projects' *Manic Miner 64* there is already *China Miner* from Intercepter and *Blagger* from Aligata

Commented Software Projects Alan Maton "It is a kind of compliment to Matthew Smith's original *Manic Miner* program on the Spectrum"

New name for Flan

FLAN has now come up with the title Enterprise Computers as a permanent and trouble-free name for the company

However, the 64K Enterprise computer will not now be launched until September, five months later than originally expected

This is due partly to the name change, and partly because the two custom chips used in the computer are not yet fully debugged

"The de-bugging of the chips is going painstakingly, but well," said marketing manager Mike Shirley "We would rather bring out a reliable product in September than an unreliable one earlier"

In addition, the 64K machine has gone up in price Originally it was to be £199 00 Now it will sell for £228 85 The increase has been blamed on rising chip costs

The 128K version of the machine has been delayed still further It is not now scheduled to appear in Britain until the beginning of 1985 Its price has been set at £299 95

Enterprise have signed a deal with Welwyn Electronics to manufacture both versions of the computer. The deal will create at least 90 jobs at Welwyn's Tyneside factory

On the software side, Enterprise has been talking to Psion and Quicksilva, among others, with a view to producing 12 to 15 original programs

Also being developed are two Basic emulator packages — for Sinclair Basic and for BBC Basic

Enterprise's most recent identity problem — its third — began in December 1983, when Elan Digital Systems of Crawley, Surrey took action over the use of the name Elan — as Enterprise then was Elan Computers became Flan as a temporary measure while they made sure they would not have similar problems over the name Enterprise

■ Bernard Dinneen wins our Flan competition and a free subscription to PCW He offered the name Teflon Computers for Flan — because they can t find a name that will stick

BBC competitor

OFFICL Equipment manufacturer Triumph Adler is to produce a low-cost competitor to the BBC micro

The Alphatronic PC is Z80-based with 64K Ram and priced at around £400

Up to 28K is available for Basic programming and the machine runs a version of Microsoft Basic It has a full-size professional keyboard with separate numeric pad and six function keys The machine has 110 pre-defined graphics characters and an 80-column text display option It has a *Beep* sound facility with only one pitch

Interfaces include a cassette port, Rom cartridge slot, Centronics and RS232 interfaces and disc interface connection

QL waiting list still growing

PCW's QL order Week 9 Still no sign

Sinclair has not yet decided on the form of compensation to be offered to customers whose orders have been delayed

The money gained in interest by Sinclair from our QL order cheque which has been cashed is now over £3 70

AVAILABLE IN APRIL

TWO NEW RELEASES
IT'S THE WOOLUF!
TUBE WAY ARMY

IT'S THE WOOLUF!
CRYSTAL
Written by Martin Buller

TUBE WAY ARMY
CRYSTAL
Written by Rainbow Software

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COMING SOON RETURN OF THE THINGS

HALLS OF THE THINGS
Written by Neil Mattershead, Simon Brattel and Martin Horsley

INVASION OF THE BODY SNATCHAS
Written by Simon Brattel and Neil Mattershead

ZEUS 64 ASSEMBLER
CRYSTAL
NEW FOR C.B.M. 64
Written by Graham Stafford

ROMMELS REVENGE
Written by Martin Horsley

THE DUNGEON MASTER
Written by Graham Stafford

All titles for 48K Spectrum unless otherwise stated

Selected titles available from— Boots, Spectrum, John Menzies, HMV, WOOLWORTH, other large department stores and all good major software retailers. Alternatively, send the coupon to—



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IT'S THE WOOLUF ☐	£6.50	ROMMELS REVENGE ☐	£6.50
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Coded data via telephone

Having read D Tomlinson's letter (*PCW* 1-7 March) on data encription I wonder how many people owning personal computers and acoustic telephone couplers realise they have all the hardware necessary for sending coded data to their friends It has seemed at times as if the half million computer mags on the shelves are all carefully avoiding this subject

The key to this idea is developing a program for coding and decoding data Personally, I would ignore all that one reads about public and private key encription systems — I don t believe half of it anyway Disinformation is the name of this game

It is well known that the most secure encoding system is the one-time pad where a table of random numbers are used to code a small message of, say, 100 letters I would suggest it is possible to write a small program to produce a continuous stream of pads' which are recorded on two cassette tapes one tape being carried away to a remote location You can imagine the number of pads which could be fitted on a C90 tape

Of course, the pseudo-random number generator of most home computers would be worse than useless for this application — you would have to devise a method of seeding true random numbers into your program I have often wondered why manufacturers do not put true random generators into their machines say something based on noise in a diode

Now let me turn to the ethics of my suggestion Realistic people have, I believe always accepted that messages by post or over the telephone will always be accessible for interception People have grumbled, but most of us just shrug our shoulders and get on with using these facilities Now that technology gives us the opportunity to communicate privately, should we embrace it or should we fret about making things easier for criminal elements to form conspiracies?

I believe that we should embrace this technology for the reason that secret police or to use the modern euphemism the security services, have the potential to be the biggest criminal conspiracy of all if wrongly directed With all the resources of the state behind them, we should always fear them most of all

So, I would suggest all amateur programmers should think about developing their own private coding systems and try real-time transmission and reception of coded messages for themselves

Now, the big question is, does British Telecom have or will it have, any regulations about sending coded data over the telephone lines?

P Shimmon
8 Selsey Court
Broadfield, Crawley
West Sussex

To the best of my knowledge, there are no regulations covering the transmission of coded data over telephone lines But, any coupler linked to the telephone system must be British Telecom approved

10 years after

Thanks a lot for inadvertently losing ten years from my age when you printed my letter (23 29 February)

I feel however, that I must clear my reputation before I am accused of being anti-education I stated that I have had many hours of amusement, which would have otherwise been wasted doing *housework* Somehow the word was lost in the translation, and ended up as *homework*! Nobody has given me any homework for quite some time now, but I would not consider it a waste of time if they did Housework on the other hand, is quite another matter

If I can persuade my micro to do the ironing or washing-up for me, then perhaps I will submit the relevant program to you On the other hand, I think I will tell the national dailies (*The Sun*, for instance?) and sell the idea to the highest bidder I am sure the Mothers' Union could summon a fair amount of money, faced with such a prospect!

Thanks for an excellent magazine which would not be the same without the Automata advertisement I look forward to that as much as to the editorial!

Gill Hesketh (over 21)
379 Liverpool Road
Eccles
Manchester M30 7HB

I am not quite sure how we lost 10 years and turned housework into homework, but we obviously owe you an apology.

As for persuading your micro to do the washing-up, what you really need is a robot (which is basically a micro with arms and legs). Cheap robots could be here sooner than you think

A room of your own

In the game *3D Ant Attack* there is an opening on the side of the 'L shaped amphitheatre, to the right of the city's entrance, which seems impossible to get into There are three openings in the structure two of which are linked by a tunnel However, there is a way of entering the third hole

After rescuing your partner, you must then stand on top of him/her, directly beneath the opening, and constantly jump towards it After a while, an ant will come along and bite your partner who will in turn jump giving you an added boost which is enough to enable you to enter the hole

Once inside you enter a room which is totally enclosed and seems to have no purpose It would be impossible to rescue your partner from the room, as you need to stand on him/her to get in Perhaps someone could write in and tell me what purpose the room serves I cannot believe it is a bug in an otherwise superb program

C Penny
120 Hatton Hill Rd
Litherland
Liverpool L21 9JW

'I know the company has been called Samurai, Elan Flan and Enterprise but I'm afraid your name escapes me'

Pascal or Forth

In his trenchant comparison of Forth and Pascal with BBC Basic, A Hegedus (*PCW* 16-22 February) discusses only control structures such as *For* loops, *While Do*, and *Case* If one considers also data structures, such as arrays and records, then to my mind the scales come down heavily in favour of Pascal In particular, the ability to define one's own non-numerical types (eg days of the week), together with the *Record* structure, enables the programmer to construct and manipulate data bases of great complexity in a remarkably simple and comprehensible way

No doubt there are still some applications for which the speed of Forth outweighs all other considerations, but as processors get faster it is difficult to imagine that a language whose central feature is reverse-polish operations on a data stack will maintain its present level of popularity.

Pascal has its defects, of course, and is not appropriate for every job, but it stands supreme at present in clarity of expression, as shown by its adoption for a wide range of practical and commercial applications, as well as in teaching

M Dodson
Department of Earth Sciences
The University
Leeds LS2 9JT



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GALACTIC

In Flight

A new game for 16 or 48K Spectrum by David Murphy

This flight simulator program runs on a 16K or 48K spectrum. This program simulates an aircraft cockpit in flight. The clocks & dials simulate the movement of the plane.

Try to land the plane on a runway. Full instructions in the program.

Program notes

LINES	
55-170	INSTRUCTIONS
175-225	VARIABLES
235-420	PRINT COCKPIT
425-990	MAIN RUNNING PROGRAM
1000-1990	LANDING PROCEDURE
2000-3000	LANDING PROCEDURE
3000-3070	CRASHING PROCEDURE
4000-4030	ANGLE



```
   5 REM ################
  10 REM FLIGHT SIMULATOR
  20 REM            BY
  30 REM      DAVID MURPHY
  40 REM        10/9/83
  45 REM ################
  50 CLS
  51 BORDER 1
  52 PAPER 7
  53 BRIGHT 1
  55 REM INSTRUCTIONS
  60 PRINT "THIS IS A FLIGHT SIM
ULATOR"
  70 PRINT "TRY TO LAND THE BOEI
NG 707"
  80 PRINT "SAFELY"
  90 PRINT "FLY THIS PLANE WITH
SKILL AND"
 100 PRINT "ACCURACEY"
 110 PRINT "DONT FORGET YOU ARE
WITH BRITISHAIRWAYS"
 120 PRINT "USE Z-X TO CONTROL A
NGLE"
 125 PRINT "USE Q-A TO CONTROL K
NOTS"
 130 PRINT "WHEN YOU ARE GOING T
O LAND THE  PLANE,ANGLE MUST BE
BETWEEN      -2 AND +2"
 135 PRINT "AND YOUR KNOTS MUST
NOT BE OVER7"
 140 PRINT "PRESS 'S  TO START"
 145 BEEP .1,0
 150 LET Z$=INKEY$
 160 IF Z$="S" THEN GO TO 180
 165 BEEP .1,40
 170 IF Z$<>"S" THEN GO TO 150
 175 REM START OF PROGRAM
 180 LET FUEL=500
 181 LET T=0
 190 LET HEIGHT=2500
 200 LET KNOT=10
 210 LET TIME=0
 220 LET ANGLE=0
 225 LET H$="
"
 230 CLS
 235 REM PRINT COCKPIT
 240 PRINT INK 4,AT 0,0,"

 245 BEEP .01,10
 250 PRINT
 260 PRINT "  KNOTS  HEIGHT  FUE
L1 FUEL2"
 270 PRINT AT 4,0,"  ",KNOT;"
  ",HEIGHT,"       ",FUEL,"   ",F
UEL
 280 PRINT
 290 PRINT INK 4,"

 300 PRINT
 310 PRINT INK 2,"          ",  P
RINT INK 3,"
 320 PRINT INK 2," TIME     ",  P
RINT INK 3,"ANGLE"
 330 PRINT INK 2,"          ",  P
RINT INK 3,"      "
 340 PRINT
 350 PRINT AT 12,0,"  ",TIME,"
  ",ANGLE
 360 PRINT AT 9,22,"FLIGHT"
 370 PRINT AT 10,22,"SIMULATOR"
 380 PRINT   PRINT   PRINT   PRI
NT INK 4,"

 390 PRINT   PRINT INK 1,AT 16,8
,"

 400 PRINT INK 1,AT 17,8,"

 410 PRINT AT 20,0,"Q=UP A=DOWN
Z=LEFT X=RIGHT"
 420 PRINT INK 4,AT 21,0,"

 425 REM FLY AIRCRAFT
 430 LET H$=INKEY$
 440 IF H$="Q" THEN LET KNOT=KNO
T+1  BEEP .01,7
 450 IF H$="A" THEN LET KNOT=KNO
T-1  BEEP .01,7
 460 IF H$="Z" THEN LET ANGLE=AN
GLE-1  BEEP .01,5
 470 IF H$="X" THEN LET ANGLE=AN
GLE+1  BEEP .01,8
 480 LET C=INT (RND*2)
 490 IF C=1 THEN LET ANGLE=ANGLE
+1
 493 LET D=INT (RND*2)
 495 IF D=1 THEN LET ANGLE=ANGLE
-1
 510 LET FUEL=FUEL-2
 520 PRINT AT 12,0,"
"
 530 PRINT AT 4,0,"
"
 540 LET TIME=TIME+1
 550 LET HEIGHT=HEIGHT-KNOT
 560 IF FUEL<=3 THEN LET FUEL=0
 570 IF FUEL<=3 THEN LET KNOT=7
 590 PRINT AT 10,9,H$
 600 IF KNOT<=5 THEN LET H$="NOS
E IS DROPPING"
 610 IF KNOT>5 THEN LET H$="
"
 615 IF KNOT<=3 THEN LET KNOT=3
 620 IF KNOT>6 THEN LET H$="NOSE
GOING UP  "
 630 IF FUEL<=0 THEN PRINT INK 2
,AT 10,9,"OUT OF FUEL"  BEEP .1,
.01
 640 IF KNOT>=8 THEN LET G=INT (
RND*3)  IF G=1 THEN LET H$="FLIG
HT PATH OK  "
 650 IF FUEL=0 THEN LET I=INT (R
ND*3)  IF I=1 THEN LET H$="YOU A
RE GLIDING"
 655 IF HEIGHT<3 THEN LET HEIGHT
=0
 660 IF HEIGHT<=1000 AND T<>5 TH
EN GO TO 1000
 670 IF HEIGHT<=3 THEN GO TO 400
0
 990 GO TO 240
1000 CLS
1010 LET D$=INKEY$
1015 BEEP .1,40
1020 PRINT INK 2,AT 11,0,"DO YOU
 WANT WHEELS (Y/N)."
1030 IF D$="Y" THEN LET T=5  CLS
   GO TO 990
1040 IF D$="N" THEN PRINT "YOU A
RE STUPID"  BEEP .1,1
1045 PAUSE 50
1046 CLS
1050 GO TO 1010
2000 REM LANDING PROCEDURE
2001 CLS
2010 PRINT INK RND*7,AT 11,1,"WE
LL DONE YOU LANDED"
2019 FOR Z=1 TO 60
2025 BEEP .1,Z
2030 NEXT Z
2500 STOP
3000 REM CRASHING PROCEDURE
3001 LET V=0
3005 CLS
3505 LET V=V+1
3007 IF V=20 THEN GO TO 3060
3008 BEEP .1,V
3010 LET A=RND*7
3020 BORDER A
3030 LET B=RND*7
3040 PAPER B
3050 GO TO 3005
3060 CLS   PAPER 7  INK 0  PRINT
 AT 11,1;"BAD LUCK YOU CARSHED"
3070 STOP
3090 REM ANGLE
4000 IF ANGLE>2 THEN GO TO 3000
4010 IF ANGLE<-2 THEN GO TO 3000
4020 IF KNOT>7 THEN GO TO 3000
4030 GO TO 2000
```

Board games

***David Kelly** talks to Peter Deutsch and Jon Baldachin of Leisure Genius*

Peter Deutsch's company Leisure Genius has, almost without anyone noticing, cornered a unique niche in computer games.

Over four years ago Peter Deutsch first started trying to get the rights to produce video games based on established board games. And since then he has reached agreement with some of the best known board game manufacturers including Waddingtons and Spears to produce micro versions of their titles.

"We never considered that we had the expertise to design our own original games ideas," says Peter. "Besides, the established games will have a longer life. Just like in the record industry — you have to keep coming up with the new *Culture Club* month after month. But Jim Reeves' records just keep on going year after year."

Board game manufacturers however were initially very hostile to the idea of video versions of their games. They felt threatened by losing sales to the micros and at the time when computers first began to take off the toy industry was in the middle of a deep recession.

"The toy industry is a very funny business," says Peter. "Everyone knows the colour of everyone else's underpants — everything is cross-licensed. Someone will do the plastic bits and market it under your name. Somebody else will do another part under their name. It is all very complicated.

"The problem for the board game companies was there was actually a demand for computer versions of board games and the toy companies suddenly found themselves having to take action against software companies who were ripping them off by producing unauthorised versions.

"Toy companies like Waddingtons wanted to keep total control over their games, but at the same time weren't sure if they wanted to become involved in producing software at all.

"If I had been a board game manufacturer two years ago I would have looked at computer games very warily. Games like *Monopoly* have been selling for 20 or 30 years and Waddingtons didn't want to rush into something that might die after a couple of years.

Some toy manufacturers also fought shy of jumping in after Atari and Mattel showed huge losses. For a toy manufacturer to involve itself directly would have been a big risk.

Says Peter: "We offered to take the risk for them — something they were only too happy to let us do."

The first game that Leisure Genius tried to produce was *Scrabble* from Spears. An Apple version was written and demonstrated to the public as long ago as 1982. And that was after two years of negotiations to tie up the contract with Spears. "I think our lawyer commutes to and from Monte Carlo on the fees from that work!" says Peter.

"What we proved with the Apple version of *Scrabble* was that a computer version of a board game could be a success."

Next, Leisure Genius came to a sub-licensing agreement with Psion to produce a Spectrum version with enhanced graphics. That game appeared last June and was very well received both as a game and as a programming achievement.

"After *Scrabble* we were able to talk with Waddingtons and other board game companies and say, effectively — 'we can do the same sort of thing for you'."

The approach obviously worked because Leisure Genius is now working on computer versions of *Cluedo* from Waddingtons, *Kensington* from Whale Toys, *Mastermind* from Invicta and *Mandala* from Future Games.

Leisure Genius is a partnership between Peter Deutsch, who looks after the business side of the company, and Jon Baldachin, who deals with the programming side. The company now has three full-time programmers working mostly on material for the Commodore 64.

John Baldachin, a former IBM programmer, bought his first micro — a Heathkit — in 1977 during a visit to the US.

Following the success of the Spectrum version of *Scrabble* by Psion, Leisure Genius decided to set up its own programming team.

"The first thing we have done," says Jon, "is to write machine-code drivers for the Apple IIe and Commodore 64. They give us the same functions available for both machines — a virtual machine environment — which allows us to write software on the Apple which will run on several machines. It is a similar approach to that if you were writing in C — you would need to produce a C compiler for each machine you wanted to run the code on."

The drivers — around 11K of machine code — are now finished for the Apple and the Commodore 64 computers and Jon and his team are working on *Scrabble*, *Cluedo*, and *Mastermind* for the Commodore 64 which should be finished by mid-April. Then work will start on the Spectrum drivers.

Once John is happy with the presentation and screen layout, the flowcharting of the game can begin. The flowcharts are written from top-down. When this is finished the programming can begin.

Most of the code for *Scrabble* and the other games on the 64 takes the form of 'machros'. These are machine-code routines which are then called by the program. "If you think of Simon's Basic which contains code that creates extra commands in Basic, then what we have done is to write code which creates extra commands in machine code called 'pseudo-ops'."

Programmers writing the games need not know how to program the processor in the target machine. Instead, they need to know how to program the common operating system offered by the driver routines.

"I made a decision to go with machine code rather than, say C, because it is faster. Also it is more sophisticated — for one thing the driver routines offer sprites.

"By the end of the year we will be producing an 8086 version of our drivers — we don't have any choice. By that time everything will be 16-bit — Sinclair has made that clear with the QL."

It is unlikely that any of the games will appear, at least in the short term, on the BBC or Electron machines though. Says Jon: "The games are ideal for the BBC machine. Unfortunately the BBC micro isn't ideal for the games. The shortage of memory would mean that writing drivers for BBC and Electron would be a pain."



Leisure Genius (left to right) Mark Stubbs, Peter Deutsch, Chris Harper and Jon Baldachin — producing video games based on established board games.


BEYOND
CHALLENGING SOFTWARE
Less than human, far more than mere computer
The Psytron controls the massive Betula 5 installation When the attack comes it will cope with defensive demands which would leave a human brain unhinged computer circuits scrambled
Damage in any sector of the base must be assessed and its effect on the fabric of the installation calculated immediately
Human lives will be expended as necessary but if the Psytron ever goes down
The Sinclair Spectrum has always attracted the best programmers It's always had the most innovative software Psion Scrabble, The Hobbit Jet Pac and now
PSYTRON
Ten screens of stunning graphics, animation which makes other programmers gasp, a 20 page booklet of hints, tips and help with the discovery of each of six levels of play
"How long can you survive the Final Conflict? A true Psytron would last an hour and a Sinclair Q.L. goes to the first person to match that feat"

Teeing off to start

***Keith and Steven Brain** beard the dragon in its lair in this latest collection of software*

The general reaction to the original software offerings from Dragon Data was that they were far from inspiring. In fairness to Dragon we must add that as the Dragon 32 was very rapidly supported by a whole host of independents, the standard expected by the user rose very quickly.

First of the latest batch of software is *Tee-Off* a golf simulation which takes place in Cowboy Country where cacti rather than trees abound. Of course, the scenario is of only minor importance compared to the playability of the game, but less forgivable is the fact that minimal efforts seem to have been taken to customise the program for the UK market.

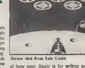
On executing the program, you are faced with a virtually unreadable display which is explained away in the booklet as "this is only for people with NTSC TVs and should be ignored by the owners of PAL 1 TVs ie UK owners". How much of that gobbledeegook is intelligible to the average user and how much effort would it have taken to simply omit that section of the program?

Having read all these complaints, you might anticipate that we did not like this program, but you would be wrong as it does take a quite interesting and novel approach to golf simulation. The game is played entirely with the joystick and you are represented by an animated figure which can walk in the direction chosen. When you feel that you are in the correct position relative to the ball to take a shot you press the fire button to visibly wind up your swing. When the button is released the club swings back and, if you are lucky, it makes contact with the ball which takes off in the appropriate direction according to your position and strength.

The power put into your stroke ('club selected') depends on the length of time for which you hold down the fire button. There are the usual hazards to avoid and when (or is that if?) you get onto the green, a close up picture is provided for the final action. Up to four players can be accommodated, but you must wait for the current player to putt the ball successfully which can be very time consuming and rather boring for the other players.

Serious golfers may feel that it does not represent as close a simulation of the real thing as, for example, Salamander's *Golf* but to the non-golfer it offers an interesting game of skill which makes a change from the 'shoot them up' genre. This is one of Dragon Data's cheapest offerings, but we feel that they should have spent a little more on UK customisation.

There are two 'zapping' offerings (both written by J F McGuire and Son) which are unusual in that they are written in Basic and use the original Computa voice program (included) to provide speech output. The simplest is *Jump Jet* in which you have to defend your airfield against enemy attack and then attempt to destroy the enemy fortress on its island. Ten skill levels are provided, with control of position and firing through the joystick. Although the screen scrolls to the left as the game progresses to reveal more of the countryside, the speed at which this occurs would disgrace a tortoise and this program gives a good demonstration



Screen shot from Lets Count

of how poor Basic is for writing arcade type games!

The title *Jump Jet* is rather misleading as you are not able to carry out the famous 'hovering' and 'viffing' manouvres which characterises combat in the Harrier. The speech is of the usual relatively unintelligible type and merely repeats screen messages. There appear to be a number of simple ways in which the program could have been improved, for example every time a hit is scored the action stops completely whilst the entire status display is rewritten.

Dragon Data have made much of the compatibility between the Dragon 64 and the Dragon 32, so it is absolutely unforgivable that *Jump Jet* crashes on line 3010 if you try it on the 64! This is because Dragon Data corrected the bug in the *Usr* function in the original 32 Rom when they produced the new bottom Rom for the 64. Since it is now well known that the bug could easily be circumvented by including a leading zero in the *Usr* call, surely it would have been more sensible to change the manual rather than the Rom. In this case the crash on the 64 can be prevented by editing out the leading zero in the *Usr* call (ie changing *Usr(080)* to *Usr8(0)* in line 3010).

The second offering from the same authors operates in a similar way to *Jump Jet* except that it does not crash on the 64. In *Shuttlezap* you must navigate your shuttle out of a silo, take it into orbit, intercept enemy sputniks and then return to base. But once again, it shows that Basic is really too slow for complex action games. In any sort of comparison with *Space Shuttle* from Microdeal it comes a very long way behind, and at £12.95 the price seems exorbitant.

One area where the speed of Basic is quite sufficient is in role-playing games, so we had higher hopes for *Viking* (from Prickly Pear again). However, this turned out to be only a slightly souped-up version of the old-hat *Kingdom* theme in which you have to steer your Viking holding in 750 AD to success by buying, selling, taxing, etc while avoiding disasters.

This particular program did not seem to have any unusual features and it has little to recommend it over the versions already available more cheaply on 'compendium' tapes, or as listings in magazines. Although

this program might just have been acceptable 12 months ago the public now expects a much higher standard than this

The sound capabilities of the Dragon are often criticised by users of other machines, although they are undoubtedly much easier to use than those on most other micros There is, of course no 'envelope' command although it is possible to simulate this to some extent through Basic

On the other hand, the *Synther-7* machine code program provides very simple but total control over sound formation thus turning the Dragon keyboard into an effective music synthesiser The screen display is divided into a number of sections At the top is a representation of a piano keyboard on which the corresponding Dragon keys are marked The keys from up arrow to clear are used so that two octaves of notes are available at any one time

The instructions cover the features of the program rather briefly but at least explain things by practical 'hands-on demonstrations When you first *Load* the program you find that these keys produce a sound very like that of a real piano instead of the usual asthmatic Dragon croak

At the right of the display are listed a series of names (eg *Gamba, Krumphorn* and *Djinni*) which are described as 'organ stops but which looked to the ignorant (ie us!) rather like refugees from Tony Bridge's Adventure Corner However, a quick delve into the dictionary revealed that these names do really have roots in mediaeval musical instruments, and experimentation

Screen shot from Cranky

soon showed how selecting a different stop transformed the sound output

A major feature of *Synther 7* is that it also provides a true *Adsr* envelope which can be very simply tailored to your particular taste The rest of the display consists of a series of histograms which show the current state of a wide range of different parameters that influence the final sound — defining envelopes here is certainly much easier than it is on the BBC As the sound output comes not only through the TV speaker but also through the cassette microphone lead, it is possible to record your efforts directly onto tape

Perhaps we should make clear that this program is a very different animal to the *Computer* program reviewed in an earlier edition of *PCW* as you can only create and record in real time, and chords are not possible It must therefore be viewed as a musical instrument, rather than as a utility for adding music to other programs It is an interesting program especially with the excellent graphic display of the sound parameters and it certainly provides a very good way of learning about, and experimenting with, sound synthesis

Finally in this selection are a pair of learning programs written by Applied Systems Knowledge Ltd The first of these *Let's*

Synther 7 — music machine

Count introduces the 3 to 7 year old to simple counting with the aid of a number of graphic games and various skill levels and rewards The program is in two sections and the whole loading procedure takes about three minutes It is clear that a lot of thought (and presumably educational expertise) has gone into this program and the instructions sensibly suggest that the child must be shown how to work the system by someone older at first

Four different games are available In the simplest *Treasure Island* you have to count the number of shields on the side of a ship and the numbers of chests shown on different islands, and move the ship to the island with the matching number The program is well designed for small children as only the minimum number of keys are used and all text is in lower case

All *movement* is produced by simply pressing the spacebar and when you have decided that you have reached the correct location you just press *Enter* A friendly 'hand symbol is used to indicate that you need to press the spacebar to continue and the sound output varies from '*What shall we do with the drunken sailor* to *Song of the Volga Boatmen* according to your performance

In the second game *Space Stations* actual numerals are introduced and you must match the number of windows on a spaceship with the numeral which appears on a space station In *Roll A-Ball* you must sort a series of numbers into ascending order and are rewarded by a rolling ball and a rising score stack

In *Which Way* you have to decide whether the number of green balls is greater than equal to or less than the number of blue balls displayed At first we were irritated to find that we had to reload the program to change the game but we soon discovered that this was due to an omission from the manual rather than from the program In fact pressing *Shift* and 'left arrow takes you straight back to the main menu

The second offering was *Cranky* which is designed for an older age range (7-11) and introduces number patterns and relationships The plot is built around a pocket calculator some of whose circuits have been damaged by rain The display first indicates the pattern of the offending circuits in Cranky's eyes and then the same pattern is shown in detail on a 10 x 10 grid containing the numbers from 1 to 100 in sequence All you have to do to make repairs is to make suitable additions and subtractions to move from one number to the next

There is however one small problem — you are only allowed to use the numbers 5 and 3 and therefore some fiendish mental gymnastics are often necessary At first sight the problems look very simple but we soon found out that looks were deceiving and had great difficulty getting the correct answers every time when we were faced by complex shapes!

Overall both of these educational programs are certainly as good as if not better than, most of the competition in the educational sector It is nice to see that the limitations of youngsters have been recognised and that for example, the same series of commands and prompts are used in both programs It is inevitable that educational programs are more expensive than simple games as the potential sales volume is much lower

Conclusions

On the specialist side Dragon has clearly added some useful programs to their range but their efforts on the straight games side are much less successful Software is only a sideline to Dragon and specialist software houses know only too well that most of the real money is to be made from popular games It is therefore not too surprising that they have been unable to lay their hands on material which can compete on equal terms with the excellent games programs produced for the Dragon by the independents

Our final word must be a plea to Dragon to spend a little more time on careful and detailed checking of the contents of pretty new boxes before they are released

Program	Price	Value (1-10)
Tee-Off	£7 95	6
Jump Jet	£7 95	3
Shuttlezap	£12 95	4
Viking	£7 95	4
Synther 7	£10 95	8
Let's Count	£10 95	8
Cranky	£10 95	8

* All programs produced by Dragon Data Ltd Kenfig Industrial Estate Margam Port Talbot West Glamorgan SA13 2PC

Catching the bus

***Boris Allan** looks et registers end counters in the Motorola microprocessors in the second of a three part series*

We are told by Sinclair Research that the QL has "ell the speed and power of 32-bit processor architecture" Sinclair Research refers to the Motorola MC68008, and last week we saw that the claim was possibly confusing

The 32-bit processor architecture of the MC68008 consists of 17 32-bit registers, two 32-bit stack pointers, a 32-bit program counter, and a 16-bit status register

For comparison, the Intel i8088 processor (used for the IBM PC) has 16-bit internal registers as does the Motorola MC6809 processor (used for the Dragon and the Tandy Color computers) Both the i8088 and MC6809 have 8-bit data busses yet the first is accounted a 16-bit chip and the second an 8-bit chip

The MC68000 series are the only microprocessors for which it can be said that all registers are 32 bit the closest to this the National Semiconductors NS16000 series has eight 32-bit registers, and an almost equal number of 24-bit pointers

The examination of the MC68000 registers has to start with the programming model (see diagram) and there is no difference between the register architecture of the MC68000 and the MC68008 More complex versions of the MC68000 series (ie the MC68010 AND MC68020) have slightly differing architectures I repeat what I said last week, the only difference between the MC68000 and MC68008 is that the first is quicker but the second is simpler to use with conventional gadgets

The first eight registers are data registers (D0-D7), used for byte (8-bit), word (16-bit), and long word (32-bit) operations The MC68000 instruction set contains instructions for hardware multiplication, and division of 16-bit and 32-bit numbers

Each data register is 32 bits wide, byte values occupy the low order 8 bits, word values the low order 16 bits, and long words the entire register Bit 0 is the rightmost/least significant bit while the most significant/leftmost bit is designated bit 31 If the register is being used for a byte operation, for example only bits 0 to seven are modified the other bits remain unaltered

The data registers can also be used as index registers as can the next eight registers (A0-A7) The first seven of these registers (A0-A6) are address registers and only recognise 32-bit values (that is long words) Sometimes word values are implied by operations and thus the low order word is used but only after the high order word is modified to maintain the correct sign

These registers can all be used as software stack pointers and as base address registers (a base address register is the lowest numbered location in an area of storage, eg the beginning of a table in memory) The system stack pointer (A7) can also be used for such purposes, but it has many other uses

The MC68000 allows the creation of user stacks and queues by use of the system stack pointer The system stack pointer is either the supervisor stack pointer (SSP) or the user stack pointer (USP) depending upon the value of the S bit in the status register The state (either 'supervisor' or 'user') determines which operations are legal

The 'privilege' state system is a means by which security can be provided in a computer system, and it works by allowing most programs to execute in user state

In this system, the accesses are controlled so that the effects on other parts of the system are limited — essential in multitasking The operating system executes in the supervisor state and has access to all resources performing housekeeping tasks for user programs

Bytes within memory are individually addressable, with the high order byte of a word having an even address which is also the address of the word The low order byte has an odd address which is one higher than the word address (this may seem back to front, but it is worth remembering that stacks on the MC68000 series fill from high memory down)

Instructions and multiple-byte data are accessed a byte at a time, in groups corresponding to the data type For example in the word read cycle the byte at the even address (ie the most significant byte) is read first and then the byte at the odd address one higher (the least significant byte) is read

Whereas with MC68000 reading a word required four distinct states, for the QL's MC68008 there are eight distinct states (ie approximately twice as slow at accessing data) Given various comparison timings, it seems as if the MC68000 is about twice as fast as the MC68008, but the MC68008 is at least as fast as the i8086 (and far quicker than the IBM PC's i8088)

After the 32-bit program counter, there comes the 16-bit status register, which is split conceptually into two bytes The user byte has five flags, four of which (negative zero, overflow and carry) are fairly common

These are a smaller complement than the flags on many 8-bit processors and only the fifth (extend) is uncommon When machine code is examined next week the meaning of these flags will be clearer

The other half of the status register is the system byte, with five flags Three bits are used to define the current interrupt level so that any interrupt of level higher than that given will be recognised The other two bits indicate whether the processor is in trace (T) mode or in the supervisor state (S)

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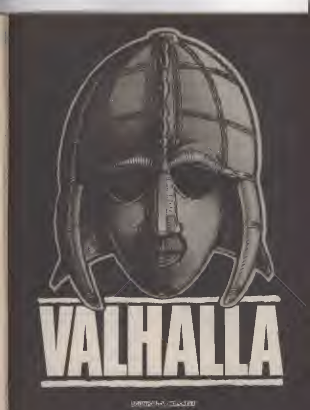


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VALHALLA
SOON FOR COMMODORE 64

Warp factor 2

***D Edwards** continues his Star Trek voyage with the second part of his three part series*

This week we will discuss how to obtain alternative character sets on the Spectrum

If you read page 173 of the Spectrum manual you will see the word *Chars* This like all other system variables, will not be recognised by name from Basic, but you can refer to them by their memory locations using *Peek* and *Poke* The system variable *Chars* holds the location of the data which is the character set Normally this is address 15616 which is in the Rom So every time the Spectrum goes to print a character whose ASCII code is between 32 and 127, it uses the system variable *Chars* and finds the bit patterns, corresponding to each character and uses them to print a character The bit patterns are defined in exactly the same way as the user defined ones by using an 8 by 8 grid as shown

Rather than using the bin function, you can work out the decimal values easily Draw your character on a grid, such as the one shown For each point containing a dot, add the appropriate value as shown above and below the grid

The actual value for *Chars* is 23606 and 23607 The numbers they contain will give the address where the character set is located. If you add them together and multiply by 256 Normally

PEEK 23606 = 0
and PEEK 23607 = 60
so address = 15626 ie the addresses of the character set
(1+60+0) = 256 = 15616

128	64	32	16	8	4	2	1	
								0
			■					16
			■					16
			■					16
			■					16
								0
			■					16
								0
128	64	32	16	8	4	2	1	

All we have to do if we wish to create a new character set is to find a suitable position in memory for it, such as 64000 and work out what this is as a two byte number The following program will do this

```
10 INPUT "Address" a
20 PRINT a-256xINT (a/256)
30 PRINT INT (a/256)
```

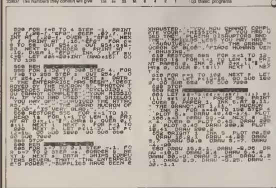
All you have to do is to *Poke* the first number produced into 23606, and the second into 23607 Then you must copy the normal character set into this area This is done by line 9500 of the initialiser Then *Poke* the data for any new characters you wish to program The formula to work out the address for each new character is

Address of character set + (Code of character to be replaced −32) x 8

Remember that each character requires 8 items of data and so must be added to this address for each bit pattern

The initialiser replaces all the upper case letters and numbers, so that whenever these characters are printed your new set will appear You may have many character sets in Ram at once and select them by *Poking Chars* with the start address With 48K you can have 55 sets in memory at any time, as each one only occupies 760 bytes — of course having this means that you have no memory left for a program!

Next week we will conclude with the rest of the listing and explain what the machine code does and show techniques to speed up Basic programs



```
 530 FOR f=5 TO 4 STEP -1. PRINT
 AT f,20-f,"EFG". BEEP .07,f. PR
INT AT f,20-f, OVER 1,"EFG". NEX
T f  PRINT AT f,16,"EFG"  FOR o=
0 TO 50  OUT 254,o  OUT 254,o+2-
23  NEXT o. BORDER 0  PRINT AT f
,16, OVER 1,"EFG". INK 7 LET su
c=0  LET an=20+INT (RND*15)  GO
 TO 135
 550 REM
 555 FOR s=30 TO 300 STEP 4. FOR
 f=0 TO 255 STEP s  OUT 254,f  O
UT 254,-f. NEXT f. NEXT s  DATA
" THE ENTERPRISE HAS BEEN","DEST
ROYED BY THE MUCRON'S","PHOTON T
ORPEDOES AND THEIR","CYCLOIDS. Y
OU CANNOT COMPLETE","YOUR MISSIO
N. IF YOU HAD USED","THE SHIELDS
 YOU MAY OF","SURVIVED THE ATTAC
KS.","","","THE GRAND MUCRON OF
 BLOB","IS VERY GLAD.","",""
 560 RESTORE 555  FOR x=1 TO 13
 READ t$  FOR l=1 TO LEN t$. PRI
NT AT 3+x,l,"█",CHR$ 8, OVER 0,t
$(l)  NEXT l  NEXT x  FOR p=1 TO
 200  NEXT p. LET pcl1=3. LET pc
l2=16  GO SUB 1000  GO SUB 860
GO SUB 7000
 565 STOP
 600 REM
 605 FOR s=7 TO 0.1 STEP -.1. FO
R b=7 TO 0 STEP -s. BORDER b  NE
XT b  NEXT s  DATA " SHIPS COMPU
TERS REVEAL THAT","THE ENTERPRIS
E'S POWER","SUPPLIES HAVE BEEN E
XHAUSTED.","YOU NOW CANNOT COMPL
ETE YOUR","MISSION. IF YOU HAD U
SED THE","PLASMA DISRUPTORS AND
THE","SHIELDS LESS YOU MAY HAVE
","SURVIVED.","","","THE GRAND M
UCRON OF BLOB","FINDS HUMANS VER
Y AMUSING."
 610 RESTORE 605  FOR x=1 TO 12
 READ t$  FOR l=1 TO LEN t$. PRI
NT PAPER 0, INK 5,AT 3+x,l,"█",C
HR$ 8, OVER 0,t$(l)  NEXT l  NEX
T x
 615 FOR p=1 TO 100  NEXT p. LET
pcl1=3  LET pcl2=16. GO SUB 100
0. GO SUB 652  GO SUB 7000
 620 STOP
 650 REM
 651 LET a$="b(ee;w(aer)  (ia) ei
(ll) get y(ou)"  PAUSE 50. PRINT
 OVER 0, PAPER 1, INK 5,AT 0,11,
" THE GRAND",AT 1,11,"  MUCRON
". INK 3  FOR a=40 TO 150 STEP 4
. PLOT 5,a  DRAW 40,40-a/4. PLOT
 165,a+3  DRAW 55,-2  NEXT a  IN
K 4. OVER 0  PLOT 0,45  DRAW 200
,2  PLOT 8,45  DRAW 200,2  PLOT
10,41  DRAW 200,2
 652 BRIGHT 1  INK 5  PLOT 80,50
  DRAW 16,2,1  DRAW -4,20  DRAW
5,7  DRAW 30,0  DRAW 5,-7. DRAW
-4,-20
 653 DRAW 15,2,1. DRAW -8,35  DR
AW -10,5  DRAW 2,4  DRAW 6,4,2
DRAW 50,-3. DRAW 3,-25  DRAW 4,2
,1  DRAW 0,3. DRAW -3,25. DRAW -
30,-1,1
```

```
654 DRAW -2,5 DRAW -3,10 DRAW -20,20,3 DRAW -20,-20,3 DRAW -3,-10 DRAW 2,-5 DRAW -30,-1,1 DRAW 3,-25 DRAW 0,-3
656 DRAW 4,2,1: DRAW -3,25 DRAW 30,-3 DRAW 2,-3 DRAW -10,-3 DRAW -3,-6,2 DRAW -6,-2 DRAW -1,-25 DRAW -2,-4 DRAW 0,-4
657 INK 4 PLOT 115,112 DRAW -2,-25 DRAW 4,3,2 DRAW 4,-3,2 DRAW -2,25
658 INK 6 PLOT 72,85 DRAW -10,-20 PLOT 72,85 DRAW 6,-25 PLOT 72,85 DRAW 0,-20
659 PLOT 170,80 DRAW 10,-20 PLOT 170,80 DRAW -5,-25 PLOT 170,80 DRAW 2,-20,1
669 FOR f=0 TO 5 STEP 2 CIRCLE INK 3,107,100,f CIRCLE INK 3,125,100,f CIRCLE INK 5,115,126,f+1 NEXT f
670 FOR f=1 TO 300 NEXT f RETURN
900 STOP
1000 REM [illegible]
1010 FOR c=pcl1 TO pcl2 PRINT AT c,1; INK 7; PAPER 0; FLASH 0; OVER 0; BRIGHT 0; INVERSE 0;"                                 " NEXT c RETURN
1040 REM [illegible]
1050 DATA "   SCANNERS REVEAL THAT YOU HAVE ","DEFACED THE CRYSTAL AND YOU","NOW CANNOT RETURN TO THE","STARBASE.","","YOU HAVE FAILED AND SO THE","ENTERPRISE WILL SELF DESTRUCT."
1055 RESTORE 1050 FOR x=1 TO 7 READ t$ FOR l=1 TO LEN t$ PRINT INK 2,AT 3+x,l,"■", INK 5,CHR$ 8, OVER 0,t$(l) NEXT l NEXT x
1060 PRINT PAPER 1, INK 6, OVER 0,AT 0,11,"DETONATION",AT 1,11," IN    SECS"
1065 FOR X=90 TO 10 STEP -1 PRINT OVER 0, PAPER 1, INK 6,AT 1,14,X BEEP X/899,X/2 NEXT X FOR x=9 TO 0 STEP -1 PRINT OVER 0, PAPER 1, INK 6,AT 1,14," ",x BEEP x/899,x/2 NEXT x FOR x=0 TO 240 STEP 5 OUT 254,x NEXT x LET pcl1=3 LET pcl2=16 GO SUB 1000 PAUSE 100
1070 DATA " THE ENTERPRISE IS DESTROYED","","THE GRAND MUCRON OF BLOB IS","ECSTATIC WITH DELIGHT" RESTORE 1070 FOR Q=3 TO 6 READ T$ FOR L=1 TO LEN T$ PRINT AT Q,L,"■",CHR$ 8, OVER 0,T$(L) NEXT L NEXT Q PAUSE 200
1075 LET pcl1=0 LET pcl2=6 GO SUB 1000 GO SUB 650 GO SUB 7000 STOP
2000 REM [illegible]
2005 PRINT OVER 0, PAPER 1, INK 6,AT 0,11," CRYSTAL " BEEP .3,-12 PRINT OVER 0, PAPER 1, INK 6,AT 1,11," LOCATED " LET disp=USR 65064 PRINT OVER 0, PAPER 1, INK 6,AT 0,11," CRYSTAL ",AT 1,11," LOCATED " PRINT AT x,y, INK 6,k$ FOR i=7 TO 1 STEP -1 PRINT AT x,y, OVER 1,"HHH" BEEP .04,10 PRINT AT x,y, OVER 1,"III" LET c=USR 65030 NEXT i
2015 FOR i=7 TO 0 STEP -1 PRINT OVER 1, INK i,AT x-1,y,"\|/",AT x,y,"|||",AT x+1,y,"/|\", OVER 1,AT x-1,y,"HHH",AT x+1,y,"III" BEEP .1,i*2 NEXT i PRINT AT x,y, OVER 0, INK 0,k$
2036 RANDOMIZE USR 65064 GO SUB 70 INK 6 FOR l=0 TO 40 STEP 4 FOR o=0 TO 1 BEEP .01,l*o OVER o PLOT 10,40 DRAW 100,l PLOT 10,150 DRAW 100,-l PLOT 245,40 DRAW -100,l PLOT 245,150 DRAW -100,-l NEXT o NEXT l
2040 LET display=USR 65064 OVER 1 GO SUB 70 OVER 0 FOR b=0 TO 1 BRIGHT b FOR i=1 TO 7 INK i PLOT 86,97 DRAW 20,20 DRAW 20,-20 DRAW 0,40 DRAW -20,-20
2045 PLOT 90,97 DRAW 80,0 DRAW -20,20 DRAW -20,-20 DRAW 0,40 DRAW 20,-20
2050 PLOT 86,97 DRAW 20,-20 DRAW 20,20 DRAW -20,-20 DRAW 20,-20 DRAW 0,40
2060 PLOT 90,97 DRAW 80,0 DRAW -20,-20 DRAW -20,20 DRAW 0,-40 DRAW 20,20
2060 BEEP .01,i*3 NEXT i NEXT b BRIGHT 0 FOR p=0 TO 100 NEXT p DATA "YOU HAVE CAPTURED THE","DILITHIUM CRYSTAL FROM THE","MUCROIDS AND BY DOING THIS","DESTROYED THEIR FLEET.","","","THE GRAND MUCRON OF BLOB IS","VERY ANGRY WITH YOU ,HE SWEARS","VENGENCE ON ALL MANKIND."
2065 RESTORE 2060 FOR p=3 TO 11 READ t$ FOR l=1 TO LEN t$ PRINT AT p,l,"■",CHR$ 8, OVER 0,t$(l) NEXT l NEXT p
2070 FOR p=1 TO 100 NEXT p LET pcl1=3 LET pcl2=16 GO SUB 1000 GO SUB 650 GO SUB 7000 STOP
3000 REM [illegible]
3001 LET s$="y(uvv) j(ii)" PAUSE 40
3005 FOR s=1 TO 10 STEP .3 FOR f=0 TO 17 STEP s OUT 254,s OUT 254,-f NEXT f NEXT s DATA "SHIPS COMPUTERS REVEAL THAT","THE TRACTOR BEAM HAS EXPLODED.","IF YOU HAD ENERGISED IT LATER","IT MAY OF LASTED LONG ENOUGH","TO CAPTURE THE CRYSTAL.","","","YOU NOW CANNOT COMPLETE YOUR","MISSION TO FIND IT.","","","THE GRAND MUCRON OF BLOB FINDS","THIS VERY FUNNY."
3010 PRINT PAPER 1, OVER 0, INK 6,AT 1,11, FLASH 1," BEAM OFF " BORDER 0 RESTORE 3005 FOR p=3 TO 15 READ t$ FOR l=1 TO LEN t$ PRINT INK 7,AT p,l,"■",CHR$ 8, OVER 0,t$(l) NEXT l NEXT p
3015 FOR p=0 TO 100 NEXT p LET pcl1=3 LET pcl2=16 GO SUB 1000 GO SUB 650 GO SUB 7000
3020 STOP
3050 LET keys=0 PAPER 0 BORDER 0 INK 7 OVER 0 BRIGHT 0 FLASH 0 CLS GO SUB 9570 LET pcl1=0 LET pcl2=21 GO SUB 1000 INK 5
3080 DATA "","   WELCOME TO MUCROID RUN","","",".   PRESS ENTER TO CONTINUE","■ "," YOU ARE THE CAPTAIN OF THE ","STARSHIP ENTERPRISE AND ARE ON","A ROUTINE PATROL MISSION.","WHILST JOURNEYING THROUGH THE ","VOID YOU RECEIVE A DISTRESS","SIGNAL FROM YOUR SISTER SHIP,","THE CHALLENGER.","","GOING TO INVESTIGATE YOU","DISCOVER THAT THE CHALLENGER","HAS BEEN DESTROYED BY THE","EVILEST,MOST VILE CREATURE IN","THE KNOWN UNIVERSE,THE GRAND","MUCRON OF BLOB.","","     PRESS ENTER TO CONTINUE","■ "
```

Move and check

***Richard Dodd** examines movement and check routines in the second of a three part series*

Program 3 reads the characters to be *Poked*, while Program 4 will *Poke* the characters to the screen. To use Program 4, the characters to be printed must be contained in *PR$* and their position in Q5 (Q5=X+(255*Y)), eg

PR$= SCORE Q5=5121 GOSUB 1480

Program 5 uses this method to display the screen for the *'Lawn Mower'* game. *Poking* the screen is fast enough for displaying the screen, but is too slow for moving graphics. To achieve speed you need to *Poke* the characters to the screen and then *GET* them. Program 6 shows how this is done. When the character is needed, it can be put to the screen as shown in Program 7 which displays the obstacles.

After defining the graphics for the game the next stage of development is to add movement. The movement routine in this game is needed to move the lawn mower. The lawn mower moves continually around the screen until it hits an obstacle. Figure 4 shows how the movement routine works. Program 8 contains the movement routine.

LINE 490	Inputs the new direction
500	Checks that it is one of the four directions
510	If it is one of the four directions let the direction equal the new direction
530-580	Moves the lawn mower
640	Goes back to the beginning of the routine

Along with the movement routine is a check routine. This routine checks to see if there is anything in the square that the lawn mower has now entered. To achieve this the position and the type of object is stored in an array *P*.

The position of the lawn mower is stored in *X* & *Y*, so to tell if the lawn mower has hit anything you can find the value of *P(X/5,Y/5)*. This will give you a value between 0 and 3.

0 A clear space
1 A tree
2 A fuel can
3 A cut patch

Program 9 contains the check routine for the program and is incorporated in the loop containing the movement routine.

LINE 570	Checks to see if a wall is hit
580	" " " tree is hit
590	" " blank square has been mowed over
600	" you have run over an oil can

Figure 4

START
INPUT A$
IS A$=↑↓→← ?
NO
YES
B$=A$
PRINT GRASS OVER THE LAWN MOWER
PRINT LAWN MOWER
PAUSE FOR P

PROGRAM 3

```
30 DIM A(122,7)
40 FOR X=32 TO 90 FOR Y=0 TO 7
50 READ A(X,Y)
60 NEXT NEXT
```

PROGRAM 4

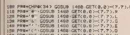
```
1480 FOR Q1=1 TO LEN(PR$)
1490 Q1$=MID$(PR$ Q1,1)
1500 IF Q1$=" " THEN 1510 ELSE Q2=ASC(Q1$)
1510 POKE (1536+Q5+(Q1-1))+Q4*32,
     255-A(Q2,Q4)
1520 Q3=Q3+1 Q4=Q4+1·IF Q4>7 THEN Q4=0·
     NEXT Q1 ELSE GOTO 1510
```

PROGRAM 5

```
170 PCLS 1
180 PR$=STRING$(26,37)+" FUEL"·Q5=256·
    GOSUB 1480
190 LINE(230,20)-(232,190),PRESET,BF
200 FOR X=0 TO 15
210 Q5=Q5+256
220 PR$="%" GOSUB 1480
230 Q5=Q5+25·PR$="%"·GOSUB 1480·Q5=Q5-25
240 NEXT
250 PR$=STRING$(26,37)·Q5=Q5+256·GOSUB 1480
260 GET(0,0)-(256,191),SR
270 PR$="!! LAWN MOWER !!"·Q5=1797·
    GOSUB 1480
280 PR$="BY"·Q5=2316·GOSUB 1480
290 PR$="RICHARD DODD"·Q5=2823·GOSUB 1480
300 PR$="    "·Q5=5127 GOSUB 1480
310 PR$="LIVES "+STRING$(LI,33)·Q5=5121·
    GOSUB 1480
320 PR$="SCORE"+STR$(SC)·Q5=5137·GOSUB 1480
330 PR$="HIGH"+STR$(HI)·Q5=5649·GOSUB 1480
340 PR$="LEVEL"+STR$(LE) Q5=5633·GOSUB 1480
350 PMODE 4 SCREEN 1,1
360 FOR PA=1 TO 1000·NEXT
370 LINE (30,55)-(190,100),PSET,BF
```

PROGRAM 6

```
30 DIM U(2),D(2),L(2),R(2),B(2),G(2),E(2),
   P(30,20),O(2),W(2),SR(1269),A(127,7)
70 PMODE 4·PCLS1 SCREEN 1,1 CLS·PRINT @
   232,"PREPARING SCREEN"
80 PR$=" " GOSUB 1480 GET(0,0)-(7,7),B
90 PR$="|"·GOSUB 1480·GET(0,0)-(7,7),D
```



```
100 PR$=CHR$(34) GOSUB 1400 GET(0,0)-(7,7),U
110 PR$="#" GOSUB 1400 GET(0,0)-(7,7),R
120 PR$="$" GOSUB 1400 GET(0,0)-(7,7),L
130 PR$="&" GOSUB 1400 GET(0,0)-(7,7),G
140 PR$="'" GOSUB 1400 GET(0,0)-(7,7),E
150 PR$="(" GOSUB 1400 GET(0,0)-(7,7),O
160 PR$="%" GOSUB 1400 GET(0,0)-(7,7),W
```

PROGRAM 7

```
380 FOR R=1 TO 15
390 A=RND(20)+1 B=RND(13)+1
400 P(A,B)=1
410 PUT(A*8,B*8)-((A*8)+7,(B*8)+7),E
420 HEXT
430 FOR C=1 TO 10
440 A=RND(20)+1 B=RND(13)+1
450 IF P(A,B)=1 THEN 440 ELSE P(A,B)=2
460 PUT(A*8,B*8)-((A*8)+7,(B*8)+7),D
470 HEXT C
```

PROGRAM 8

```
480 X=80:Y=80:P(10,10)=0:F=20
490 A$=INKEY$:IF A$="" THEN 520
500 IF A$<>CHR$(94) AND A$<>CHR$(10) AND
    A$<>CHR$(8) AND A$<>CHR$(9) THEN 520
510 B$=A$
520 PUT(X,Y)-(X+7,Y+7),G
530 IF B$=CHR$(94) THEN Y=Y-8:PUT
    (X,Y)-(X+7,Y+7),U
540 IF B$=CHR$(10) THEN Y=Y+8:PUT(X,Y)
    -(X+7,Y+7),D
550 IF B$=CHR$(8) THEN X=X-8 PUT
    (X,Y)-(X+7,Y+7),L
560 IF B$=CHR$(9) THEN X=X+8:PUT(X,
    Y)-(X+7,Y+7),R
630 FOR PA=1 TO P:NEXT
640 GOTO 490
```

PROGRAM 9

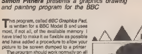
```
570 IF X=0 OR X=200 OR Y=0 OR Y=144 THEN
    PUT(X,Y)-(X+7,Y+7),W:GOTO 650
580 IF P(X/8,Y/8)=1 THEN PUT(X,Y)-(X+7,
    Y+7),E GOTO 650
590 IF P(X/8,Y/8)=0 THEN BN=BN+1:P(X/8,
    Y/8)=3:IF BN=175 THEN 840
600 F=F+1 IF F<20 THEN 620 ELSE LINE(230,
    F-1)-(232,F),PSET,BF
610 IF F>130 THEH PUT(X,Y)-(X+7,Y+7),
    B:GOTO 650
620 IF P(X/8,Y/8)=2 THEN P(X/8,Y/8)=0:
    F=F-50 IF F<25 THEN LIHE(230,190)-
    (330,20) PRESET,BF ELSE LINE(230,190)
    -(232,F),PRESET,BF
```

Painting by numbers

***Simon Pithers** presents a graphics drawing and painting program for the BBC*

This program, called *BBC Graphics Pad*, is written for a BBC Model B and uses most, if not all, of the available memory. I have tried to make it as flexible as possible and have added a procedure to allow your picture to be screen dumped to a printer.

The program should work normally on all versions of BBC Basic as I have already tried it on Basic I & II. For users with O S 1 0 or below, line 190 should be replaced as in the Rem statement.



This program has been split into two halves. The second half will be printed next week.

Program Procedures:

PROCscreen — This Procedure sets up the MODE 2 screen
PROCkeywords — This prints the utility keywords in the left hand box
PROCinput — This asks the user to enter a choice
PROCmovecursor — This allows the user to move the pen around etc
PROCclsinfospace — This clears the left hand side box
PROCwait — This make the computer wait for about a second
PROCcircle — This allows the user to draw a full or empty circle in any colour
PROCsave — This allows the user to save the picture
PROCload — This allows the user to load back the picture

```
10 REM ********************
20 REM *                  *
30 REM *   GRAPHICS PAD   *
40 REM *                  *
50 REM *    (c) 1984      *
60 REM *                  *
70 REM *    G.C.Pithers   *
80 REM *                  *
90 REM ********************
100
110
120 MODE7
130 PRINTTAB(3,10);"Do you want
    instructions (Y/N)"
140 A$=GET$
150 IF A$="N" THEN 180
160 CLS
170 PROCprogramdetails
180 MODE2
190 *FX200,1
200 REM Above for OS 1.0 onwards only
210 REM if OS 0.1 then use  ON ERROR GOTO ERL
220 VDU23;8202;0;0;0;
230 PROCscreen
240 PROCinput
250 END
260
270
280 DEF PROCscreen
290 X%=640:Y%=312
300 X1%=640:Y1%=312
310 GCOL0,2
320 MOVE0,200:DRAW1280,200
330 COLOUR6
340 PROCkeywords
350 VDU 28,10,31,19,26
360 VDU 29,0;200;
370 VDU 24,0;200;1280;1024;
380 COLOUR 5
390 ENDPROC
400
410
420 DEF PROCkeywords
430 VDU 28,0,31,19,0
440 PRINT TAB(0,26);"Tri  Circ";
450 PRINT TAB(0,27);"Box  Vdus";
460 PRINT TAB(0,28);"Save Load";
470 PRINT TAB(0,29);"Move-curs";
480 PRINT TAB(0,30);"END";
490 VDU 28,10,31,19,26
500 ENDPROC
510
520
530 DEF PROCinput
540 CLS
550 COLOUR3
560 PRINT"Enter a"
570 PRINT"letter"
580 A$=GET$
590 IF A$="T" THEN PROCtriangle:GOTO540
600 IF A$="C" THEN PROCcircle:GOTO540
610 IF A$="B" THEN PROCbox:GOTO540
620 IF A$="S" THEN PROCsave:GOTO540
630 IF A$="L" THEN PROCload:GOTO540
640 IF A$="V" THEN PROCvdu:GOTO540
650 IF A$="M" THEN PROCmovecursor:GOTO540
660 IF A$="E" THEN PROCend
670 SOUND1,-15,50,5
680 CLS
690 COLOUR1
700 PRINT"INVALID"
710 PRINT"KEYWORD?"
720 PROCwait
730 GOTO 540
740 ENDPROC
750
760
770 DEF PROCmovecursor
780 PROCclsinfospace
790 VDU 28,0,31,19,0
800 COLOUR5
810 PRINT TAB(0,26);"Press S"
820 PRINT TAB(0,27);"to go to"
830 PRINT TAB(0,28);"keywords"
840 PRINT TAB(0,29);"1=Pen on"
850 PRINT TAB(0,30);"2=Pen off"
860 VDU 28,10,31,19,26
870 CLS
880 COLOUR7
890 PRINT TAB(0,0);"C=Colour"
900 *FX12,5
910 *FX11,5
920 D=3:C=7:ST=4
930 GCOL0,C
940 PLOT69,X%,Y%
950 REPEAT
960   GCOL D,C
970   IF INKEY(-98) THEN PLOT69,X%,Y%:
      X%=X%-ST:PLOT69,X%,Y%
980   IF INKEY(-67) THEN PLOT69,X%,Y%:X%=
      X%+ST:PLOT69,X%,Y%
990   IF INKEY(-73) THEN PLOT69,X%,Y%:Y%
      =Y%+ST:PLOT69,X%,Y%
1000  IF INKEY(-105) THEN PLOT69,X%,Y%:
      Y%=Y%-ST:PLOT69,X%,Y%
```

```
1010    IF INKEY(-49) THEN Q=0
1020    IF INKEY(-50) THEN Q=3
1030    IF INKEY(-83) THEN C=C+1:PLOT69,X%,
        Y%:GCOL0,C:PLOT69,X%,Y%
1040    IF C=8 THEN C=0
1050    IF C=0 THEN PLOT 69,X%,Y%
1060    PRINTTAB(0,3);"COL=";C;" "
1070    IF INKEY(-82) THEN PROCclsinfospace:
        PROCkeywords:ENDPROC
1080    PRINTTAB(0,1);"X=";X%;"  "
1090    PRINTTAB(0,2);"Y=";Y%;"  "
1100    IF X%<5  X%=4
1110    IF X%>1275 X%=1276
1120    IF Y%<5 Y%=4
1130    IF Y%>819 Y%=820
1140    UNTILFALSE
1150 ENDPROC
1160
1170
1180 DEF PROCclsinfospace
1190 VDU 28,0,31,19,0
1200 PRINT TAB(0,26);"                 "
1210 PRINT TAB(0,27);"                 "
1220 PRINT TAB(0,28);"                 "
1230 PRINT TAB(0,29);"                 "
1240 PRINT TAB(0,30);"                 "
1250 VDU 28,10,31,19,26
1260 *FX12,0
1270 *FX11,0
1280 *FX15,1
1290 ENDPROC
1300
1310
1320 DEF PROCwait
1330 FOR Z=1 TO 2000:NEXT
1340 ENDPROC
1350
1360
1370 DEF PROCcircle
1380 PROCclsinfospace
1390 VDU 28,0,31,19,0
1400 COLOUR6
1410 PRINT TAB(0,26);"Enter"
1420 PRINT TAB(0,27);"Radius"
1430 PRINT TAB(0,28);"& Colour"
1440 VDU 28,10,31,19,26
1450 CLS
1460 PRINT"X Radius="
1470 INPUT R%
1480 CLS
1490 PRINT"Y Radius="
1500 INPUT R1%
1510 CLS
1520 GCOL0,0:PLOT69,X%,Y%
1530 PRINT"Colour="
1540 INPUT C
1550 CLS
1560 PRINT "Filled in"
1570 PRINT "or not ?"
1580 PRINT "Y or N"
1590 INPUT FI$
1600 IF FI$="Y" OR FI$="y" THEN 1690
1610 CLS
1620 GCOL0,0:PLOT69,X%,Y%
1630 GCOL0,C
1640 MOVEX%,Y%+R1%
1650 FORF%=1TO366STEP12
1660    B=F%*PI/180
1670    DRAW R%*SIN(B)+X%,R1%*COS(B)+Y%
1680    NEXT:GOTO1760
1690 GCOL0,C
1700 MOVEX%,Y%+R1%
1710 FORF%=1TO366STEP12
1720    B=F%*PI/180
1730    MOVEX%,Y%
1740    PLOT85,R%*SIN(B)+X%,R1%*COS(B)+Y%
1750    NEXT
1760 CLS
1770 PROCclsinfospace
1780 PROCkeywords
1790 ENDPROC
1800
1810
1820 DEF PROCsave
1830 PROCclsinfospace
1840 CLS
1850 VDU 28,0,31,19,0
1860 COLOUR1
1870 PRINT TAB(0,26);"SCREEN"
1880 PRINT TAB(0,27);"SAVEING"
1890 PRINT TAB(0,28);"FILENAME"
1900 PRINT TAB(0,29);"=PADFILE"
1910 VDU 28,10,31,19,26
1920 PRINT"ARE YOU"
1930 PRINT"SURE (Y/N)"
1940 INPUT A$
1950 IF A$="N" THEN CLS:PROCclsinfospace:
     PROCkeywords:ENDPROC
1960 CLS
1970 *SAVE"PADFILE" 3000 70FF
1980 PRINT"SAVED"
1990 PROCwait
2000 *FX12,1
2010 CLS
2020 PRINT"Do you want"
2030 PRINT"to end the"
2040 PRINT"program."
2050 INPUT A$
2060 IF LEFT$(A$,1)="Y" OR LEFT$(A$,1)="y"
     THEN PROCend
2070 CLS
2080 PROCclsinfospace
2090 PROCkeywords
2100 ENDPROC
2110
2120
2130 DEF PROCload
2140 PROCclsinfospace
2150 CLS
2160 VDU 28,0,31,19,0
2170 COLOUR3
2180 PRINT TAB(0,28);"LOADING"
2190 PRINT TAB(0,27);"SCREEN"
2200 VDU 28,10,31,19,26
2210 PRINT"ARE YOU"
2220 PRINT"SURE (Y/N)"
2230 INPUT A$
2240 IF A$="N" THEN CLS:PROCclsinfospace:
     PROCkeywords:ENDPROC
2250 CLS
2260 PRINT "Press any"
2270 PRINT "key to"
2280 PRINT "start the"
2290 PRINT "loading."
2300 A$=GET$
2310 *LOAD "PADFILE" 3000
2320 PRINT"LOADED"
2330 PROCwait
2340 CLS
2350 PROCclsinfospace
2360 PROCkeywords
2370 ENDPROC
2380
```

A little byte music

Richard Barton concludes his SID chip demonstration program

This is the second part of Richard Barton's program for the Commodore 64 which demonstrates all the facilities of the SID chip. The first part was published last week.

The program is easy to operate and controlled either from the keyboard or a joystick. It also gives full opportunities for variations on the character of each note.

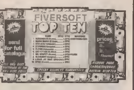
The listing below is self-explanatory, and Rems are used to clarify the various sections of the program.

```
18060 IFRG>1THENPRINT "T":GOTO18050
18065 IFRG=1THENRG=4
18070 PRINTCHR$(147) RETURN
20000 REM SECTION TWO ##################
20010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
20020 PRINT" SECTION TWO (SPECIAL)            R204 "
20025 PRINT"PLAY NO CONTROL KEYPAD WHILST VIEWING"
20030 PRINT"SELECT CONTROL FROM FOLLOWING -
20040 PRINT" 1 <- PITCH SYNC VOICE TWO WITH ONE
20050 PRINT" 2 <- PITCH SYNC-VOICE TWO WITH THREE"
20060 PRINT" 3 <- PITCH SYNC-VOICE ONE WITH THREE"
20080 PRINT" 4 <- VOICE THREE DISABLE
20084 PRINT" 5 <- VOICE THREE FREQUENCY UTILISATION"
20085 PRINT" 6 <- ENVELOPE OUTPUT UTILISATION
20087 PRINT" 7 <- RETURN TO MENU ONE
20091 GETA$ IFA$="" THEN20091
20093 A=VAL(A$)
20095 IFA>7THEN20091
20096 PRINTCHR$(147)
20097 ONAGOTO21000,22000,23000,24000,25000,26000,10
21000 REM PITCH SYNC-TWO WITH ONE######
21010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
21020 PRINT" PITCH SYNC-TWO WITH ONE          R204 "
21030 INPUT"SELECT SYNC- ON=1/OFF=0 ";S2
21040 IFS2=1THEN...
21099 GOTO10
22000 REM PITCH SYNC THREE WITH TWO#####
22010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
22020 PRINT" PITCH SYNC-THREE WITH TWO        R204 "
22030 INPUT"SELECT SYNC- ON=1/OFF=0 ";S3
22040 IFS3=1THENS3=...
22999 GOTO10
23000 REM PITCH SYNC-ONE WITH THREE#####
23010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
23020 PRINT" PITCH SYNC-ONE WITH THREE        R204 "
23030 INPUT"SELECT SYNC- ON=1/OFF=0 ";S1
23040 IFS1=1THENS1=2
23999 GOTO10
24000 REM VOICE THREE DISABLE########
24010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
24020 PRINT" VOICE THREE DISABLED             R204 "
24030 INPUT"SELECT DISABLE- ON=1/OFF=0 ";...
24035 IF...>1THENPRINT"T":GOTO24030
24040 IFZZ=1THENZZ=128
24999 GOTO10
25000 REM VOICE THREE FREQUENCY UTIL###
25010 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
25020 PRINT" VOICE THREE FREQUENCY UTILISED   R204 "
25030 PRINT"SELECT CONTROL FROM FOLLOWING -
25040 PRINT" 1 <- CONTROL PITCH ... ONE
25050 PRINT" 2 <- CONTROL PITCH ... TWO
25060 PRINT" 3 <- CONTROL FILTER FREQ
25065 PRINT" 4 <- RETURN TO MENU
25070 GETA$ IFA$="" THEN25070
25080 A=VAL(A$)
25090 IFA>4THEN25070
25095 PRINTCHR$(147)
25100 ONAGOTO28000,29000,30000,10
28000 REM ############################
28010 REM FREQ MODULATION OF V1 BY V3
28020 REM ############################
28030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
28035 PRINT" FREQ MODULATION OF 1 BY 3        R204 "
28040 INPUT"SELECT CONTROL- ON=1/OFF=0- ";C1
28045 IFC1>1THENPRINT"T":GOTO28040
28060 GOTO10
29000 REM ############################
29010 REM FREQ.MODULATION OF V2 BY V3
29020 REM ############################
29030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
29035 PRINT" FREQ MODULATION OF V2 BY 3       R204 "
29040 INPUT"SELECT CONTROL- ON=1/OFF=0- ";C2
29045 IFC2>1THENPRINT"T":GOTO29040
29060 GOTO10
30000 REM ############################
30010 REM FREQ MODULATION OF FILT BY 3
30020 REM ############################
30030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
30035 PRINT" FREQ MODULATION OF FILTER BY V3  R204 "
30040 INPUT"SELECT CONTROL- ON=1/OFF=0- ";C3
30045 IFC3>1THENPRINT"T":GOTO30040
30050 PRINTCHR$(147):GOTO10
32000 REM ############################
32010 REM VOICE ONE ... CONTROL(EN 3)
32020 REM ############################
32030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
32040 PRINT" VOICE ONE PITCH CONTROL BY EN (3) R204 "
32050 INPUT"CONTROL ON (1=YES/0=NO)";O1
32060 IFO1>1THENPRINT"T":GOTO32050
32090 PRINTCHR$(147):GOTO10
33000 REM ############################
33010 REM VOICE TWO PITCH CONTROL EN 3)
33020 REM ############################
33030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS
33040 PRINT" VOICE TWO PITCH CONTROL BY EN (3) R204 "
33050 INPUT"CONTROL ON (1=YES/0=NO)";O2
33060 IFO2>1THENPRINT"T":GOTO33050
33090 PRINTCHR$(147):GOTO10
```

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```
34000 REM ******************************
34010 REM F. TER FREQ C    L T  EN/(C)
34020 REM ******************************
34030 PRINT" VD SO NW GENERATOR CHIP C   E T
34040 PRINT" F C   TEX CONT OU  L  TC      F004
34050 NF                  =C   J  0S
40000 IFU    THEPRINT     J 40TO
40000 PRINT HP$  42) GOTO A
40000 REM ******************************
40010 REM DISPLAY ALL CURRENT VALUES
40020 REM ******************************
40023 PRINTCHR$ 47
40030 PRINT"  I     O   HTUR        K
40040 PRINT J     ALL CURRENT  ALUE      F284
40045 PRINT    CONTROL       ALL   ABOUT   W
40050 PRINT"  VOICE ONE PITCH        = hl -
40051 IFW1-17THENW1$="RAMP"
40052 IFW1=65THENW1$="SQUARE"
40053 IFW1=129THENW1$=WHITE NOISE
40054 IFW1    THENW1$=   TOOTH
40055 PRINT  VOICE ONE WAVEFORM      =W1$
40056 PRINT"VOICE ONE DUTY CYCLE    = J  -
40060 PRINT"VOICE TWO PITCH         = h2 - L
40061 IFW2=17THENW2$="RAMP"
40062 IFW2=65THENW2$="SQUARE"
40063 IFW2=129THENW2$="WHITE NOISE
40064 IFW2=33THENW2$= SAWTOOTH
40065 PRINT"VOICE TWO WAVEFORM
40066 PRINT"VOICE TWO DUTY CYCLE    =
40070 PRINT" VOICE THREE PITCH
40071 IFW3=17THENW3$= RAMP"
40072 IFW3=65THENW3$="SQUARE
40073 IFW3=129THENW3$= WHITE NOI
40074 IFW3=33THENW3$= SAWTOOTH
40075 PRINT"VOICE THREE WAVEFORM
40076 PRINT"VOICE THREE DUTY CYCLE
40082 IFFM=16THENF0$="LOW PASS
40083 IFFM=32THENF0$= BANDPASS
40084 IFFM=64THENF0$= HIGH PASS
40085 IFFM=80THENF0$="NOTCH REJECT
40087 IFFM=0THENF0$= FILTER OFF
40090 PRINT" FILTER MODE            F$
40092 PRINT FILTER CUTOFF FREQUENCY
40093 PRINT FILTER RESONANCE LEVEL
49990 GETA$ IFA$=""THEN49990
49995 PRINTCHR$(147  GOTO 0
50000 REM******************************
50010 REM COMPLETE RESET OF   I  S
50020 REM******************************
50030 RUN
```




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Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £8 for each program published.

Space Sweeper

on Vic 20

In this game for the unexpanded machine you are in control of a mine sweeper. Your task is to clear sectors of space of mines. They are highly dangerous so don't run into one. For each mine destroyed you get 10 points and four extra fuel units. There are five controls using the keyboard:

A Rotate right
D Rotate left
S Accelerate
H Hyperspace
Spacebar fires torpedo

The computer displays your acceleration, the amount of fuel units remaining and your score. Watch your fuel level and don't use too much acceleration.

To make the game more difficult or easy change the amount of fuel units given in line 295.

Variables

SC	Score
VOL	Sound volume
SHIP	Character of ship
FUEL	Fuel units
X	Position of ship on screen
A$	Command
DELAY	Delay loop

Program notes

9-10
Jump to character creating routine

10-30	Set up variables and clear screen
30-31	Sound effects for Hyperspace
31-32	Prints mines randomly on screen
30-81	Gets command and acts accordingly
90-91	Acceleration routine
95-190	Moves ship
200-286	Firing torpedo routine moves torpedo and checks to see if it has hit a mine
290-300	Explosion routine
400-456	Ending routine
500-600	Sets up user defined graphics

```
1 REM ******************
2 REM * SPACE SWEEPER *
3 REM *                *
4 REM *BY STEVEN GREEN*
5 REM *                *
6 REM *    1982        *
7 REM ******************
8 REM
9 GOSUB500
10 POKE36879,8 SC=0
15 PRINT"" VOL=36878
20 POKE650,255 POKE36869,255
25 VEL=0 SHIP=1 FUEL=100
30 X=7910
32 PRINT"" FORA=0TO10 G=INT(RND(1)*400) POKEG+7680+30720,6 POKEG+7680,10 NEXTF
35 GET A$ IF FUEL=<1THEN400
36 POKE36878,15:FORA=241TO135STEP-1:POKE36875,A:NEXTA:POKE36878,0 : POKE36875,0
37 PRINT""
38 PRINT"" INT(VEL) "" INT(FUEL) " " SC
40 IFA$="A"THENSHIP=SHIP-1 FUEL=FUEL-1
45 IFSHIP<1THENSHIP=8
50 IFA$="D"THENSHIP=SHIP+1 FUEL=FUEL-1
51 IFA$="H"THEN FUEL=FUEL/2 GOTO31
55 IFSHIP>8THENSHIP=1
56 FOR DELAY=0TO50 NEXTDELAY
60 IFA$="S"THEN85
64 IFA$=" "THEN200
65 POKEX+30720,1
70 POKEX,SHIP
80 IFVEL>0THEN91
81 GOTO35
85 REM
90 VEL=VEL+2 FUEL=FUEL-1
91 REM
95 Y=X
96 FOR DELAY=0TO50-VEL*5 NEXTDELAY
100 IFSHIP=1THENY=Y-22
105 IFSHIP=2THENY=Y-21
110 IFSHIP=3THENY=Y+1
115 IFSHIP=4THENY=Y+23
120 IFSHIP=5THENY=Y+22
125 IFSHIP=6THENY=Y+21
130 IFSHIP=7THENY=Y-1
135 IFSHIP=8THENY=Y-23
140 IFY=<7702THENY=Y+441
145 IFY>=8161THENY=Y-441
150 P=PEEK(Y)
155 IFP<>32THEN400
160 POKEY+30720,0
165 POKEY+30720,1
170 POKEX,32
175 POKEY,SHIP
185 VEL=VEL-.5
190 GOTO35
200 REM
210 Y=X
215 FORR=0TO10
220 POKEY,SHIP
230 IFSHIP=1THENY=Y-22
235 IFSHIP=2THENY=Y-21
240 IFSHIP=3THENY=Y+1
245 IFSHIP=4THENY=Y+23
250 IFSHIP=5THENY=Y+22
255 IFSHIP=6THENY=Y+21
260 IFSHIP=7THENY=Y-1
265 IFSHIP=8THENY=Y-23
270 IFY=<7702THENY=Y+441
275 IFY>=8161THENY=Y-441
276 P=PEEK(Y) IFP<>32THEN290
280 POKEY+30720,1 POKEY,46
281 FORDELAY=0TO10 NEXTDELAY
282 POKEY,32
285 NEXTR
286 GOTO35
290 IFP=10THENPOKEY,11 SC=SC+10
291 FORL=15TO0 STEP-1
292 POKE36877,125 POKEY,32
    POKEY+30720 ... POKEY,9
... DATA ...
... DATA ...
... RETURN
```

continued on page 37 ▶

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Open Forum

```
?3 POKEVOL ..
294 POKEY+30720,2 FUKEY [illegible]
295 NEXTL POKEY,32 FUEL=FUEL+4 PU E [illegible]77 0
300 GOTO35
400 POKE36869,240 PRINT" "
410 PRINT"GAME OVER"
420 IF FUEL 1 THEN440
425 PRINT"YOU RAN OUT OF FUEL" PRINT [illegible]
440 PRINT PRINT"YOU CRASHED"
450 PRINT"AND GOT A SCORE OF [illegible]
455 END
500 POKE51,0 POKE55 0 POKE52 28 POKE[illegible]
510 FORI=7168TO7679 POKEI PEEK[illegible]+25600) NEXTI
520 FORC=7176TO72?2 READA POKEC,A NEXTC
530 DATA 16,16 16,56,124 124 255 130
540 DATA 1 2 252 124,124 28 29 4
550 DATA 16,240 248 127 245 240 1[illegible]
560 DATA [illegible] 28 28 124 124 252 [illegible]
570 DATA 108 255 124 124 [illegible]
580 DATA [illegible]
590 DATA [illegible]
[illegible] DATA [illegible]
[illegible] DATA [illegible] 10 [illegible] 120 [illegible]
[illegible] DATA [illegible]
[illegible]
```

Space Sweeper
by Steven Green

Colour Codes

on Spectrum

This program helps you to work out the colour codes for resistors — it can be very helpful for building electronic projects

Although the basic program is very simple, I have used user defined graphics to make it visually appealing

```
              GRAPHIC NOTES

   ±=A  ¬=B  \=C  ⌐=D  /=E  A=F

               VARIABLES

X+T=USER GRAPHICS
A FIRST  BAND OF COLOUR
B SECOND BAND OF COLOUR
C THIRD  BAND OF COLOUR[ NO.OF ]
                       [ ZEROS ]

              TOLERANCES
IF SHOWN AS A DOT ON BODY OR 4th
                 RING

WHITE ±1%             RED    ± 2%
GOLD  ±5%             SILVER±10%

     1 BROWN
     2 R E D
     3 ORANGE
     4 YELLOW
     5 GREEN
     6 BLUE
     7 PURPLE
     8 GREY
     9 WHITE
     0 BLACK

               RESISTOR
             © By D.BURNS

Hold  RESISTOR with tolerance
band to  the  left-hand  side
and read colours from left to
right.Type the colours one at
a time into your spectrum and
it will print out  the values
in the blue box.

            ANY KEY CONTINUES

  10 GO SUB 0250
  20 POKE 23609,255
  30 BORDER 6
  40 PRINT AT 9,4,"Do you want i
nstructions"
  50 PAUSE 0
  60 IF INKEY$="y" OR INKEY$="Y"
 THEN CLS : GO SUB 280
  70 CLS
  80 PRINT INK 7, PAPER 0,AT 1,1
0,"TOLERANCES",AT 2,2,"IF SHOWN
 AS A DOT ON BODY OR 4th",AT 3,1
3,"RING"
  90 PRINT AT 5,1,"WHITE ±1%
    RED    ± 2%",AT 6,12,"-  I
NK 6,"  ", INK 3,"  ", INK 3,"  ",
INK 2," ", INK 0,"  ",AT 7,1,"GOL
D  ±5%       SILVER±10%"
 100 PRINT PAPER 6,AT 10,4,"1 BR
OWN",AT 11,4,"2 R E D",AT 12,4
,"3 ORANGE",AT 13,4,"4 YELLOW",A
T 14,4,"5 GREEN",AT 15,4,"6 BLU
E",AT 16,4,"7 PURPLE",AT 17,4,
"8 GREY",AT 18,4,"9 WHITE",AT
19,4,"0 BLACK"
 110 PRINT AT 14,16, INK 5,"
     ",AT 15,16,"  ", I
NK 0,"A", INK 5,"  ",AT 16,16,"
      "
 120 INPUT A: IF A>9 OR A<0 THEN
 GO TO 120
 130 PRINT AT 15,17;A: INPUT B:
IF B>9 OR B<0 THEN GO TO 130
 140 PRINT AT 15,18;B: INPUT C
 150 IF C>6 OR C<0 THEN GO TO 14
0
 160 IF C=0 THEN PRINT AT 15,19,
" "
 170 IF C=1 THEN PRINT AT 15,19,
"0"
 180 IF C=2 THEN PRINT AT 15,19,
"00"
 190 IF C=3 THEN PRINT AT 15,19,
"000"
 200 IF C=4 THEN PRINT AT 15,19,
"0000"
 210 IF C=5 THEN PRINT AT 15,19,
"00000"
 220 IF C=6 THEN PRINT AT 15,19,
"000000"
 230 PAUSE 0
 240 GO TO 110
 250 DATA 24,24,126,24,24,0,126,
0,0,0,0,0,254,254,7,3,192,224,11
2,56,28,14,7,3,0,0,0,0,127,127,2
24,192,3,7,14,28,56,112,224,192,
0,24,36,36,36,165,66,0
 260 FOR T=0 TO 47: READ X: POKE
 USR "A"+T,X: NEXT T
 270 RETURN
 280 PRINT AT 2,10,"RESISTOR",AT
 3,8,"© By D.BURNS"
 290 PRINT AT 5,1,"Hold  RESISTO
R with tolerance   band to  the
 left-hand  side   and read colo
urs from left to   right.Type th
e colours one at   a time into y
our spectrum and   it will print
 out  the values   in the blue b
ox."
 300 PRINT AT 15,12,"-", INK 4,"
 ", INK 2,"  ", INK 5,"  ", INK 6,
"  ", INK 0,"¬"
 310 PRINT AT 16,11,"/        \"
 320 PRINT AT 20,6,"ANY KEY CONT
INUES"
 330 PAUSE 0
 340 RETURN
```

Colour codes
by D Burns



Open Forum

Sounds

on Commodore 64

This program is written to help you gain user control in real time in the SID sound synthesizer chip.

The listing is well supplied with *Rems* which can be left out if desired. There is provision for altering all the parameters of the three 64 voices (plus white noise) and even games paddle control of the various voice treatments is possible. The program utilises the Filter, Ring Modulator, Waveform control, Pulse width control, etc. With care some very professional sounding effects can be achieved.

```
1 REM SID CHIP DEMO (C8M 64)
2 REM RICHARD BARTON 1984
3 PRINT"J"
4 POKE53281,1
5 REM PRESET TO MAKE A CHORD **********
6 H1=8 L1=97 H2=10 L2=143 H3=25 L3=30 W1=17 W2=17 W3=17 BP=64 RZ=0
9 FORI=1TO28 POKE54272+1,0 NEXTI REM    ZERO ALL ADDRESSES IN SID CHIP
10 POKE54296,(15+LP+BP+HP) REM SET VOLUME/FILTER MODES
20 POKE54277,190 POKE54278,240 REM ADSR(VOICE ONE)
21 POKE54284,190 POKE54285,240 REM ADSR(VOICE TWO)
22 POKE54291,190 POKE54292,240 REM ADSR(VOICE THREE)
24 IFXD=0THENPOKE54293,Q POKE54294,R REM C/O FILTER
25 IFXD=1THENPOKE54293,PEEK(54298) POKE54294,PEEK(54298) REM EXTERNAL CONTROL
26 POKE54295,(7+RE) REM RESONANCE FILTER
27 IFD1=0THENPOKE54275,J1 POKE54274,K1 REM DUTY CYCLE - VOICE ONE
28 IFD2=0THENPOKE54282,J2 POKE54281,K2 REM DUTY CYCLE - VOICE TWO
29 IFD3=0THENPOKE54289,J3 POKE54288,K3 REM DUTY CYCLE - VOICE THREE
31 IFD1=1THENPOKE54275,PEEK(54298)/15 POKE54274,PEEK(54298) REM EX.PULSEV1
33 IFD2=1THENPOKE54282,PEEK(54298)/15 POKE54281,PEEK(54298) REM EX.PULSEV2
35 IFD3=1THENPOKE54289,PEEK(54298)/15 POKE54288,PEEK(54298) REM EX.PULSEV3
39 IFXA=0THENPOKE54273,H1 POKE54272,L1 REM VOICE ONE PITCH
40 IFXB=0THENPOKE54280 H2 POKE54279,L2 REM VOICE TWO PITCH
44 IFXC=0THENPOKE54287,H3 POKE54286 L3 REM VOICE THREE PITCH
45 IFXA=1THENPOKE54273,PEEK(54297) POKE54272,PEEK(54297) REM EXT.CNTRL(VOICE1)
46 IFXB=1THENPOKE54280,PEEK(54297) POKE54279,PEEK(54297) REM EXT.CHTRL(VOICE2)
47 IFXC=1THENPOKE54287,PEEK(54297) POKE54286,PEEK(54297) REM EXT.CHTRL(VOICE3)
50 POKE54276,W1+RZ POKE54283,W2+RZ POKE54290,W3+RZ REM WAVEFORM/RING MODULATOR
60 GOSUB1000
70 GOTO20
1000 REM MENU DISPLAY **************
1010 PRINT ■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
1020 PRINT"■ MENU SECTION                    R.BARTON84 ■"
1030 PRINT"SELECT CONTROL FROM FOLLOWING -"
1040 PRINT"■■■ 1 ■ ←  ■VOICE ONE PITCH"
1050 PRINT"■■ 2 ■ ←  ■VOICE TWO PITCH"
1060 PRINT"■■ 3 ■ ←  ■VOICE THREE PITCH"
1070 PRINT"■■■ 4 ■ ←  ■VOICE ONE WAVEFORM"
1080 PRINT"■■ 5 ■ ←  ■VOICE TWO WAVEFORM"
1090 PRINT"■■ 6 ■ ←  ■VOICE THREE WAVEFORM"
1200 PRINT"■■■ 7 ■ ←  ■ALL VOICE FILTERS"
1210 PRINT"■■■ 8 ■ ←  ■ALL VOICE RING MOD."
2000 GETA$ IFA$=""THENRETURN
2003 A=VAL(A$)
2005 IFA$>CHR$(56)THEN2000
2007 PRINTCHR$(147)
2010 ONAGOTO4000,6000,8000,10000,12000,14000,16000,18000
4000 REM *************************
4010 REM VOICE ONE PITCH CONTROL
4020 REM *************************
4030 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
4040 PRINT"■ VOICE ONE PITCH CONTROL           RB84 ■"
4050 INPUT"■INPUT HIGH CODE-",H1
4060 INPUT"■■■■■■■LOW CODE-",L1
4065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)",XA
4070 PRINTCHR$(147) RETURN
```

continued on page 41 ▸

```
6800 REM **************************
6810 REM VOICE TWO PITCH CONTROL
6820 REM **************************
6830 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
6840 PRINT"■ VOICE TWO PITCH CONTROL          RB84 ■"
6850 INPUT"■INPUT HION CODE-",H2
6860 INPUT"■■■■■■LOW CODE-",L2
6865 INPUT"EXTERNAL CONTROL(1=VFS/0=NO)".XB
6870 PRINTCHR$(147) RETURN
8000 REM **************************
8010 REM VOICE THREE PITCH CONTROL
8020 REM **************************
8030 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
8040 PRINT"■ VOICE THREE PITCH CONTROL        RB94 ■"
8050 INPUT"■INPUT HIGH CODE-",H3
8060 INPUT"■■■■■■LOW CODE-",L3
8065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)",XC
8070 PRINTCHR$(147) RETURN
10000 REM ******************
10010 REM VOICE ONE WAVEFORM
10020 REM ******************
10030 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
10040 PRINT"■ VOICE ONE WAVEFORM CONTROL       RB84 ■"
10045 PRINT"■CODES ARE 17-33-65-129■"
10050 INPUT"■INPUT WAVE CODE-",W1
10051 IFW1<>17ANDW1<>33ANDW1<>65ANDW1<>129THENPRINT"]", GOTO10050
10052 IFW1<>65THEN10070
10054 PRINT"■■■INPUT DUTY CYCLE REQUIRED-■"
10056 INPUT"■ENTER NI CODE (0-15)-",J1
10057 IFJ1>15THENPRINT"]", GOTO10056
10059 INPUT"■ENTER LO CODE (0-255)-";K1
10060 IFK1>255THENPRINT"]", GOTO10059
10065 INPUT"■EXTERNAL CONTROL(1=YES/0=NO)-",D1
10070 PRINTCHR$(147) RETURN
12000 REM ******************
12010 REM VOICE TWO WAVEFORM
12020 REM ******************
12030 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
12040 PRINT"■ VOICE TWO WAVEFORM CONTROL       RB84 ■"
12045 PRINT"■CODES ARE 17-33-65-129■"
12050 INPUT"■INPUT WAVE CODE-",W2
12051 IFW2<>17ANDW2<>33ANDW2<>65ANDW2<>129THENPRINT"]", GOTO12050
12052 IFW1<>65THEN12070
12054 PRINT"■■■INPUT DUTY CYCLE REQUIRED-■"
12056 INPUT"■ENTER HI CODE (0-15)-",J2
12057 IFJ1>15THENPRINT"]", GOTO12056
12059 INPUT"■ENTER LO CODE (0-255)-",K2
12060 IFK1>255TNENPRINT"]", GOTO12059
12065 INPUT"■EXTERNAL CONTROL(1=YES/0=NO)-",D2
12070 PRINTCHR$(147) RETURN
14000 REM ********************
14010 REM VOICE THREE WAVEFORM
14020 REM ********************
14030 PRINT"■■■SID SOUND GENERATOR CHIP EXPERIMENTS"
14040 PRINT"■ VOICE THREE WAVEFORM CONTROL     RB84 ■"
14045 PRINT"■CODES ARE 17-33-65-129■"
14050 INPUT"■INPUT WAVE CODE-",W3
14051 IFW3<>17ANDW3<>33ANDW3<>65ANDW3<>129THENPRINT"]", GOTO14050
14052 IFW1<>65THEN14070
14054 PRINT"■■■INPUT DUTY CYCLE REQUIRED-■"
14056 INPUT"■ENTER HI CODE (0-15)-",J3
14057 IFJ1>15THENPRINT"]", GOTO14056
```

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Open Forum

```
14059 INPUT"ENTER LO CODE (0-255)-",K3
14060 IFK1>255THENPRINT"T", GOTO14059
14065 INPUT"EXTERNAL CONTROL(1=YES/0=NO)-",D3
14070 PRINTCHR$(147) RETURN
16000 REM ****************
16010 REM ALL VOICE FILTERS
16020 REM ****************
16030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
16040 PRINT" FILTER CONTROL                           RB84 "
16045 INPUT"INPUT HIGH CODE-",Q
16046 INPUT"LOW CODE-",A
16048 INPUT"EXTERNAL CONTROL?(1=YES/0=NO)",XD
16049 IFXD>1THENPRINT"T", GOTO16048
16050 INPUT"TYPE OF FILTER(L/B/H/N)-";FM$
16060 IFFM$="L"THENFM=32 GOTO16080
16062 IFFM$="B"THENFM=64 GOTO16080
16064 IFFM$="H"THENFM=128 GOTO16080
16065 IFFM$="N"THENFM=160 GOTO16080
16070 PRINT"T", GOTO16050
16080 INPUT"RESONANCE SETTING (1-15)",RS
16081 IFRS<1ORRS>15THENPRINT"T", GOTO16080
16083 RE=RS*16
16190 PRINTCHR$(147) RETURN
18000 REM *************
18010 REM RING MODULATOR
18020 REM *************
18030 PRINT"SID SOUND GENERATOR CHIP EXPERIMENTS"
18040 PRINT" RING MODULATOR CONTROL                RB84 "
18050 INPUT"RING MODULATOR?(1=YES/0=NO)",RG
18060 IFRG>1THENPRINT"T",GOTO18050
18065 IFRG=1THENRZ=4
18067 IFRG=0THENRZ=0
18070 PRINTCHR$(147) RETURN
```

Sounds
by Richard Barton

Microradio

GW6JJN

Bearcat scanner radio

An interesting item of news has reached Microradio this week concerning a new product made by a company called Electra based in the United States. If you're feeling rich, their phone number is area code 317 894-1440, and you need to be fairly wealthy to buy their Bearcat Compuscan Scanner Radio.

Many amateurs are already familiar with the Bearcat range of scanners which operate mostly on the VHF and UHF bands where all the interesting things happen. Here are the aircraft bands, the marine and shipping frequencies, the taxis and road services — even, your friendly local gas and electricity board, or television repair man, to name but a few. More importantly, there are two amateur bands, television signals and downlink transmissions signals of all sorts. There are simply so many frequencies involved and so much going on that I have often thought a computer was needed to sort it all out.

Electra had the same idea and came up with the Compuscan. This is designed to interface with the Commodore 64 computer and comes complete with a program on disc, a mains adapter, an indoor aerial, various connecting cables and the Bearcat Compuscan itself. Basically it is a black box (white, in fact) that you connect into the computer and into which you plug an aerial. The dial doesn't exist anymore and the means to scan the bands or choose a particular frequency is all done via the computer keyboard and the monitor. Not only will the computer find the stations you select, but it will remember all those stations it found while scanning around. Interesting thought that — Big Brother is listening.

On the whole, I think I prefer to twiddle the knobs myself and write the stations I hear down in the logbook. After all, some things are still better done with a paper and pencil. If you disagree, the Bearcat Compuscan Scanner Radio can be yours for a mere $500. You pays your money and you takes your choice.

Must mention here two recent publications reaching Microradio. The first is the excellent SARUG (Sinclair Amateur Radio Users Group) Newsletter which contains many good program listings and information for Sinclair users interested in radio. For those of you who are not Sinclair Users there is the RAMTOP newsletter fresh off the presses with goodies for all radio-computing enthusiasts. SARUG can be reached by SAE to 4 Red House Lane, Leiston, Suffolk IP16 4JZ. Likewise RAMTOP SAE to Great Billing Rectory, Northampton NN3 4ED.

Ray Berry GW6JJN



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REVIEWS
"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners ... Simply smashing!" Soft, Sept 83
"Colossal Adventure is included in Practical Computing's top ten games choice for 1983: Poetic and tough as hell." PC, Dec 83
"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you." NILUG issue 1.3
"Dungeon Adventure is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!" Educational Computing, Nov 83
"Snowball ... As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens ... this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers." Which Micro? Feb 84
"Lords of Time. This program, written by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue. As we have come to expect from Level 9, the program is executed with wonderful style – none of those boring "You can't do that" messages! Highly recommended." – PCW 1st Feb 84
Level 9 adventures are available at £9.90 from good computer shops, or mail order from us at no extra charge. Send order or SAE for catalogue to the address below – and please describe your micro.
LEVEL 9 COMPUTING
Dept 229 Hughenden Road High Wycombe Bucks HP13 5PG

Tony Bridge's Adventure Corner

Worth the price?

Software can be very expensive nowadays! *The Hobbit* was the first of the British programs to charge £15 but in this case the buyer was getting
a) one of the best adventures available
b) a well-produced manual
c) a copy of the book to boot (or read, as you wish!)

No one can complain about that for value, but what about *Trader*, that was mentioned by Mr Valentine last week? This is called, in the adverts "a graphic adventure" It isn't really, being rather a series of braintwisters, separated by slowly-drawn graphics which rely heavily on arcs and circles Although the packaging was, for its time (late 1982 being written by Pixel for the ZX81, selling for £7, and only later being updated for the Spectrum and Vic 20) rather nice it was never worth the asking price In fact, it had an attention-span of about 5 minutes!

Anirog seem to come out quite well in Mr Valentine's mini-review (see last week's page) I haven't seen any of their programs (hint hint), but *The Dungeons*, in particular, seems worthwhile investigating

Crush Crumble & Chomp would not I must admit, figure on my list of good adventure programs. It is, to be sure, a very good game that I enjoy playing (although, as Mr V pointed out, it is rather pricey — but this is true of most American imports) — and although I am certainly in favour of allowing many arcade games to receive the honorary title of adventure, *C,C & C* is not one of them! It is, however, a good strategy game, and one in which you, for once, are the alien!

The Valley has always been a *D & D* favourite of mine The scenario concerns the adventures of the player, in this case taking on the role of Alehan, a young wizard, in his battles against the evil Vounim There are a lot of spells to be used and a lot of monster-bashing and gold-collecting

The responses are ultra-fast though not very subtle in fact they consist of not much more than stab or slash? , the answer to which you have to give in about two seconds before being battered by whatever monster it is that you're fighting! Great stuff! And I would have given the program rather more than 4 out of 10

I was surprised to hear of *Alanan's Revenge* though — I remember that ASP had some trouble a few months ago with copies of their game on the market (the company who perpetrated that have since disappeared)

The Orb (which I remember from the early days of the Spectrum) and *The Kingdom* are oriented too much toward luck as Mr Valentine says I still think that adventures should be solved through skill and cunning rather than sheer good fortune (bad fortune, too, can play a large part, which is not so good when you've made a series of calculated moves)

Mr Valentine ends his letter with a plea for help — "How do I get past the bear in *Adventureland* without losing the royal jelly? And now do I get across the lava?" Well, bears are notorious, in adventures, as in real life, for being pretty hungry! This, of course, necessitates losing the Royal Jelly — so you could try surprising him in some way As for the lava .. well, upon reflection (hint! hint!) I would try to get rid of the heat in some way!

That should also help Richard Briggs, of Thornford, in Dorset, who is also playing *Adventureland* at the moment.

Leaving Scott Adams for now, let's turn to Wintersoft's *Ring of Darkness* Some months ago, I asked my colleague, John Scrivener, to review this program for Adventure Corner — I have not seen the game yet, although there is now a version for several of the most popular micros and it has been well received Neil Scrimgeour writes from Corby "I have been stuck for about two months in *Ring Of Darkness* The problem is that I have completed dragon's sign quest been down labyrinth of doom and become a level 2 dwarf, but I cannot seem to get any more money I can't complete other quests because I can't buy enough hit points or food with only 150 gold pieces Is there any other way I can gain money easily, apart from killing bandits etc? With regard to another adventure *Franklin's Tomb* it may be helpful to have a bath plug when entering the aquarium

Thanks for that tip Neil I've been stuck there myself for weeks In the meantime can anyone help with those *Ring of Darkness* problems?

This week, just two names in The *Hobbit Hall of Fame* the first is particularly noteworthy as J L Davies is the first person (to let me know, anyway!) who has completed *The Hobbit* on the Oric He gained a creditable score of 77 5 per cent "Experience,' says J L, "has taught me that there are plenty of locations yet to be explored If any Oric owners are being driven to distraction by any particular part of the adventure, I would be only too glad to assist."

The other name for the *HHOF* this week is Ian Ferguson on his Spectrum Ian asks for help in a couple of adventures, the first being the excellent *Inca Curse*, from Artic of course "How do I put out the fire? Also in *Ship of Doom*, how do I get the key from beneath the glass?"

First, the fire Using our little code (starting at the second letter read off every other letter — when you get to the end return to the first letter and repeat the process

TSHMSOLT/AHNE/KREW'TI

and to get the key

IPCO/DIRN/ITVS/EORN

Ian carries on "Now a suggestion — please review *Gateway* to the *Skies* by Solarsoft I can assure you that you will not regret it Howard Goodman the author has excelled himself with this fabulous game True it was featured on the New Releases page but this did not give the public a fair insight into the wonderful game

I have not seen this Adventure, Ian, but Wizard Taylor's page each week would give you at least a vague idea of what to expect, an out-and-out arcade shoot-em-up or a relaxed mind puzzle Having said that, Ian why not write a review for me — the game obviously means a lot to you! Why not let everyone in on your discoovery?

[illegible]

Peek & Poke



BUSINESS AID

Tommy Udall of Hadley Road, Cockfosters, writes

Q I have a Commodore 64 I am quite happy with it, though I am finding a few problems creating sprites

I would like to know if the 64 can handle CP/M. I want to be able to use my computer to help my father who has his own business I have been told that CP/M needs another (Z80) Cpu. Is this true? If so, can it be attached to the Commodore?

A You are correct in that CP/M can only be Run on a Z80 Cpu Commodore have had a Z80 card planned for a long time but it has had production problems It should be available in the form of a plug in cartridge, but the timing is still uncertain

Please note that you will need to have a disc drive attached If you do not have Commodore's own drive then you will need an additional interface as well as the disc drive

KEYBOARD CHANGE

Graham Todd of Deerswood Road West Green Crawley West Surrey writes

Q Having recently bought a Dk'Tronics keyboard for my Spectrum I now find myself with a perfectly serviceable but unnecessary Spectrum keyboard. Could you advise me whether or not I could use this with my ZX81? If so, could you tell me if any hard/software alterations are needed?

It seems silly to waste my old keyboard, but so far neither Sinclair nor Dk'Tronics have replied to my enquiry.

A Both the keyboards are identical, in that they use the same grid of 8x5 (8 address lines and 5 data lines) The data lines are mapped into the same numbers D0 to D5

There should be no problems if you are careful If any problems do develop it is most likely that the address lines will have been misrouted and you might have to change one or two of these around It goes without saying that this will void your guarantee

SKI SCROLLS

Dorian Bloch of Park Hill Road, East Croydon, Surrey writes

Q I have a BBC model B and a commercial game which scrolls to the right However I would like to make it scroll downwards I was thinking of putting in a few lines, before *Loading* to turn the screen 90° clockwise, is this possible? (The game is *Ski Slalom* by RH Electronics.)

A In all honesty I do not know why you want to change the screen display Scrolling up or down, usually by just printing off the top line of the screen, invariably produces inferior results, when compared to the well written Machine Code side scroll you have in Ski Slalom

More importantly, it is, to say the very least, difficult to do A routine to rotate the screen display, wouldn't be sufficient as the main fabric of the program would have to be changed To move a single pixel point one place to the right, you increment by one Simple, but to move it up or down you need to increment by the difference in screen lines which, in turn, depends on mode

Just to make things difficult, besides the actual programming task involved, there is the added problem that Ski Slalom is one of the few non Acorn programs that uses the locking facility within the new 1 2 OS When some of the details of this system were broken and published, Acornsoft prosecuted. The case never went to court, the publisher involved settled out of court Do you know how to break into the Lock?

WIPE OUT

Miss K D Yardwood of Meadow Croft, Hatfield Herts, writes

Q Please could you help me and perhaps give a warning to other computer owners I have a remote control TV and a Spectrum 48K When I went to use it the other day I could not get it to work, not even the (c) 1982 notice Is it possible that the infra red remote control has wiped out the ROM? If not what could it be?

A I would be very surprised indeed if your remote control was to blame, as far as wiping out your roms Certainly infra-red can be used for this, but this involves Eproms which have the actual silicon wafer within the chip, exposed to the radiation for some hours I presume that you did not dismantle your Spectrum

To be honest I think the problem lies elsewhere Assuming you have tried the obvious items such as the leads, and the fuse in the plug, have you tried re-tuning your television? It is well known that most home computers, not least the Spectrum, are liable to wander off station Have you tried using your computer on a friend's television?

JOB PROSPECTS

Heather Manley of Maindiff Court Hospital, Abergavenny, writes

Q Would you give me some advice? I want to buy a computer in order to learn *Basic* and improve my job prospects. I was thinking of the Vic starter pack.

A I am not certain that the Vic is necessarily the best for your purposes despite its many advantages — the Basic is not of the best and with its use of control codes etc, wouldn't be much like the kind of Basic you would meet in a job

You need a computer with a fairly standard Basic that can also run other languages, few jobs require Basic many need *Fortran* and *Cobol* My suggestion (in the same price range) would be either the Spectrum 48K (the Basic is slightly odd but you have quite a large range of other languages you can run on it) or the Electron (excellent BBC Basic although not many other languages as yet). One other alternative might be to get a ZX81 starter pack which is a cheap and reasonable introduction to the subject

MAKING MUSIC

Francis De Forne of Hayes, Kent, writes

Q I have heard of a program where a joystick can be used on a Commodore 64 to play music. Is this true? I have a CBM 64 which I was given for a Christmas/Birthday present, and I have a joystick as well If there is such a game could you tell me where I can get it?

A By the time you see this, it should be available in your local computer shop The program you are thinking of is '*Dancing Feats* and it is an unusual and impressive program from Artic The price is £6 95, and it allows a great many rhythm variations to be set against a melody line The real advantage is the program will not let you get out of tune

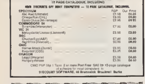
Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem write to Ian Beardsmore and every week he will Poke back as many answers as he can. The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2R 3LD.

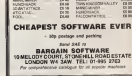


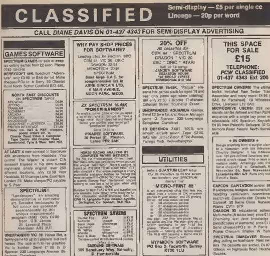
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SPECTRUM 48K with power pack in original packing including manual and 3DVU software £120 Tel 01389 9010 after 6pm

GOOD HOME OFFERED to Spectrum 16-48K. Tight and so must be cheap bordering on free! Phone 0223 730394 if your feeling generous

SEVERAL SPECTRUM BOOKS at half price Tel 07606 402.

SPECTRUM S/W to sell Used tapes include Kong Powerstorm Chequered Flag Manic Miner Hobbit, Guide etc. Tel Upper Cwmtwrch 830141

48K SPECTRUM interface I & II microdrive speech synthesiser and printer full size keyboard above £200 of s/w and lots more Will not separate Ring for details Tel Kilbarchan 2208

48K SPECTRUM with s/w and mags £100 Tel 01 800 4062 (after 5.30pm)

SPECTRUM S/W will sell or swap Hunchback TransAm Chequered Flag Death Chase Zzoom Manic Miner Games Designer Omnicalc Pool and many more 01-800 7208 any time

SPECTRUM SOFTWARE for sale Knight's Quest, Magic Mountain Black Planet Black Crystal and Galaxy Attack £3.50 each Excellent condition. Wanted any level 9 adventures Will swap Tel 0282 20344 after 6pm

48K SPECTRUM with printer and 5 rolls of printer paper also Spectrum above £150 Tel (0483) 720774

SPECTRUM SOFTWARE. Chequered Flag Blind Alley and Winged Avenger All 3 for £7 Any offers Tel Burnham (06286) 62843

SPECTRUM PROGRAMMABLE joystick interface (Stonechip) 2 months old Perfect condition £18 ono Also Quickshot joystick, perfect condition together with interface £25 ono S. Jones 9 Adelaide Street, Ch-le-St Co Durham or telephone Durham (0385) 887074

SPECTRUM 48K with or without racer joystick and software Excellent condition only will pay £80 to £100 Ring only if you live in East Anglia. 0054 30609 after 4.45pm

SINCLAIR SPECTRUM 48K 2 weeks old and tapes plus tape player £140 Southend (0702) 711184

SPECTRUM Modem conversion tape (VTX 5000) Reconfigures keys for packet switch stream £4 ono Tel Steve Gold (Sheffield 0742) 668867

ZX PRINTER £30 Currah Speech £20 Fuller master unit £45 plus £300 of software. Phone for details Glyn 0378-83290

Wanted

ATARI INTERFACE Module (850) also wish to swap rom cartridges Submarine Commander Oric Attack Phone (061) 724 5663 evenings

VIC 20 PIRATE COVE to swap for Mission Impossible sale Asteroids A.V.I.T.W. Arcadia and Blitz to swap Tel (0228) 28554 after 6pm

SWAP SPECTRUM Software Hunter Killer for level 9 Digital Fanatics Advent, Aquaplane for Fighter Pilot Ant Attack for 3D Combat Zone Traversion or Maziacs. A Davis 31 Foley Street Wednesbury W Midlands.

ACORN ATOM software wanted Your Atom programs bought or exchanged Send details to Andy Watson, 23 Hilton Street Aberdeen AB2 3QT

ARCADE ACTION Dinky Kong and Ultra. Hornchurch 42842

32K RAM upgrade for issue two Spectrum Reasonable price considered Tel Thorne (0405) 815116

SPECTRUM AND CBM 64 software Makers originals with cassette slips Will pay immediate cash on collection in London area Large batches preferred No mailing trading Details Telephone 01-630 0904

SPECTRUM SOFTWARE SWAP many titles including Hobbit Dictator Apocalypse Send list for mine by return or sell half price. Send SAE for list martin Wright 12 Egremont Avenue Withington Manchester

BBC VIEW or Wordwise Chips. Pay up to £25 St Albans 61303

16K SPECTRUM. Lowest price considered Preferably within London area. Tel 01 388 7011 ext 58 Office hours

WILL SWAP COMPUTER Battleships game or Electronic Project Lab for ZX Printer Currah Speech Synth or Fuller Orator Phone Toby on Shersham 55126 Sussex after 5pm to swap or sell

DRAGON COMPUTER Pen friend wanted Willing to swap and exchange programs and help with problems give tips and give information to each other Botley 3111

TEXAS INSTRUMENTS Home Computer and cartridges plus joysticks and tapes to swap for a ZX Spectrum 48K plus software Eastbourne 58772.

SPECTRUM S/WARE to swap Adventures Arcade utilities diverse Send your list for mine Eddie Earley 46 Anner Road Dublin 8 Ireland.

BBC B 1.2 O/S. Luton (0582) 68829 with price

48K SPECTRUM for a reasonable price Tel Tunbridge Wells 47528

DRAGON 32 and cassette unit and joystick Will pay up to £120 and p&p Tel Leeds (4532) 551405

CASSETTE RECORDER plus leads wanted for Atari 800 excellent condition only Please take price Tel 0908 311453

WANTED, SPECTRUM 48K with leads and manuals will collect, preferably London area. Upminster 21441 after 5pm

IF YOU live in South London ring 01-274 9231 for Spectrum s/w swaps exchanges Ask for Barry

EXCHANGE ZX81 16k and 17 tapes which include 71 games for Oric 16k or 48k or Spectrum 16k or sale with s/w if possible tel Lance 770653.

WANTED, 48K Spectrum with leads and manuals perfect condition willing to pay £60–£70 ono Phone Large 673471 after 6pm

SPECTRUM SOFTWSRE swap or sell ½ price Tel Swansea 206840

VIC 20 3-slot mother board also want Star Battle cartridge Tel Yoxall (0543) 472381

COMMODORE 64 SOFTWARE, to swap or sell Attack of the mutant Camels, Matrix Rox Scramble Star Trek Labyrinth, Mister Manic, Vortex Raiders, Tix Monopoly Tel 800 2689 before 6pm

SWAP SPECTRUM 48K software over 150 progs D Arbour Patrick, 16 Rue du Borrego 75020 Paris France

SWAP KX2 ATU For the keen short wave listener in exchange for ZX Printer and power unit ATU as new Tel 0224 643131 evenings

MEMOTECH CENTRONICS Interface and for Memotext. Tel 021 559 8345 after 6pm

COMMODORE 64 GAMES PAy cash for originals Swap others Tel 01-368 8043 (Cindy)

ANY PROGRAMS For The Aquarius Tel Mansfield (0623) 860358

GAMES DESIGNER for Vic 20 around £6 (0742) 694457

SWAP VIC 20 and Hi Res and 16K expansions and above plus software Atari VCS and joystick and cartridges plus paddles for your CBM 64 or BBC 'B' or sell for £120 (0274) 664528

SWAP SPECTRUM 48K plus printer five rolls paper Valhalla Zzoom Manic Miner Pimania and tape recorder for basic Commodore 64 without tape unit. Tel 056 589 398

VIC OWNER pen pal wanted to swap software tips, etc. Write to Andrew Overton 20 Falconer Lane Fence Woodhouse 161 Sheffield S13 9ZL

GORF CARTRIDGE for Vic 20 to swap for The Count or Omega Race Tel Wormley (042879) 2226 after 4pm

MISSION IMPOSSIBLE for Vic 20 to swap for The Count or Omega Race Tel Wormley (042879) 2226 and 5pm

SWAP SMX for Vic 20 and cassette recorder or sell for £80 ono Tel (67) 23174 Scotland

48K SPECTRUM Will pay around £80 and swap for portable tv Also needed s/w for Spectrum and tape recorder Phone Stanley 31737 5pm

C64 64 SOFTWARE to swap Manchester 061 7862146

ADVENTURE HELPLINE

Micro *ZX Spectrum*
Adventure *Valhalla*
Problem *Where can Ofnir be found and who will open the cupboard in the cave in hell for you?*
Name *Andrew Morris*
Address *66 Park Road Silverdale, Newcastle Staffs, ST5 6LP*

Micro *Spectrum 48K*
Adventure *Velnor's Lair*
Problem *How do you get past the shark pool? Does the stately empty cave have a secret door?*
Name *Joe Hen*
Address *Nijenburg 42,1081GG, Amsterdam, Holland*

Micro *Commodore 64*
Adventure *The Heroes of Karn*
Problem *I am with Beren and at the castle I get overpowered by guard who puts me in dungeon, how do I get out?*
Name *Mark Brayne*
Address *26 Colburn Avenue Hatch End Middx HA5 4PF*

Micro *ZX Spectrum 48K*
Adventure *Super Spy*
Problem *I Can't seem to be able to crack the codes or coded messages telling me where to go Could you advise?*
Name *David Armour*
Address *70 Thomas Street, Glascote, Tamworth, Staffordshire B77 3PR*



SPECIAL OFFERS
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commodore
20 STARTER PACK £139 95
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JOYSTICK & I/FACE FROM £17 95
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DISC DOCTOR £33
GRAPHICS ROM £33
GREMLIN M/C AID £33
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SEIKOSHA GP100A £189
EPSON RX80FT £325
EPSON FX80 £419
SHINWA CP80 £230
10X £247
MCP40 PRINT/PLOT £130
SMITH CORONA TP1
DAISY WHEEL £247
SILVER REED EX43 TYPEWRITER & INTERFACE £399
JOYSTICKS
CRACKSHOT £9 95
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TRIGGA COMMAND £11 95
QUICKSHOT £11 95
QUICKSHOT II £14 95
THE ARCADE £14 95
KEMPSTON £14 95
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ANY REPAIR MAX £25 00
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BIRMINGHAM
Tel: 021-458 4564

PYTHONESQUE

The Quest for the Holy Grail is a graphics adventure from Dream Software, based loosely on the Monty Python film of the same name

In terms of the quality of the graphics, *Holy Grail* is roughly *Knight's Quest* quality A quick play suggests the puzzles are going to be nearly as difficult to solve The big difference is that the adventure is populated by CND supporters nuclear overpowered lamps and other anachronisms

The game is neatly packaged in a box with a moderately funny booklet explaining the plot for £5 95 I have a feeling you'll be hearing a lot more about this one from Tony Bridge in the coming months

Program *The Quest for the Holy Grail*
Price *£5 95*
Micro *Spectrum 48K*
Supplier *Dream Software*
PO Box 64
Basingstoke
RG21 2LB

DIAMONDS

Suddenly, everybody is discovering that not only can you have sprite graphics on the Spectrum you can also have them on the Vic20

Bongo, which requires an extra 16K features a mouse who must overcome all sorts of obstacles to marry a Princess. The way to win her is to collect her lost diamonds — surely no basis for a sound relationship?

Anyway, getting the diamonds involves the usual running and jumping over all kinds of ladders and holes etc, and as you would expect from sprites, the graphics are large and smooth moving There are six different screens for *Bongo* (the mouse) to negotiate and three different skill levels

Program *Bongo*
Price *£7 95*
Micro *Vic20 (16K)*
Supplier *Anirog*
29 West Hill
Dartford
Kent

DIVING DEEP



Just when you thought it was safe to go back into the water, CRL have brought out *Glug Glug* You are a deep sea diver salvaging treasure from the ocean floor, and avoiding at all costs, any marine life on the screen — they're all hostile Luckily your dive is equipped with a ray gun and an unlimited supply of ammunition

The game is enjoyable both for its simplicity and originality Played on progressively more difficult levels, it can seem very easy at first, but rapidly becomes tricky as a wider variety of fish wiggle back and forth Look out for the sharks at Level 6 — they're out only after you, but will also eat through your line

The graphics on *Glug Glug* are particularly pleasing, as each fish is clearly distinguishable and recognisable However the sound effects' advertised on the cover are only really as good as you can expect from the Spectrum

Program *Glug Glug*
Price *£5 95*
Micro *Spectrum 48K*
Supplier *CRL Ltd*
9 Kings Yard
Carpenter's Road
London E15 2HD

DESIGNER

In the same way that there is no need for computer knowledge to write decent text adventures with *the Quill* so *Dungeon Builder* intends to provide the same facility for graphic adventures

Obviously, such an elaborate system is going to demand an extensive review but, sticking my neck out, I think the program is going to prove superb, and should have quite a number of the lesser Spectrum adventure houses worried

The program divides neatly into the two parts, text logic and pictures The latter are produced by a straightforward designer option which lets you draw with the keyboard and fill in shapes with different colour — with care you can get good results

The text logic part of the program is less easily summarised Basically, it operates in a similar way to *The Quill* — you describe objects, locations and the logic that links them using a number of memories Like *Quill* it's essentially easy to use except that you must think about the logical implications of what you wish to do very carefully before you begin

Program *Dungeon Builder*
Price *£9 95*
Micro *Spectrum 48K*
Supplier *Dream Software*
PO Box 64
Basingstoke
RG21 2LB

TURMOIL

If you are one of those masochists who like adventure games that are very difficult indeed then *Klartz & the Dark Forces* could be for you

The world (as is usually the case in adventure games) is in turmoil — overrun by Klartz and his forces (they're the ones who are dark) Does anyone else out there share my doubt about Klartz as a name to conjure up fear and trembling — surely, he sounds a bit weedy?

Like *Time Lords*, the game is set in several time zones and in each there are particular

Pick of the week

RAID THE LARDER

Caesar the Cat was a marvellously endearing program for the Commodore 64 Now it is available for the Spectrum

The idea of the game is to move a cat — Caesar — around a larder grabbing the army of mice who are nibbling away at all the goodies to be found there

Caesar works on a strict time limit — he must keep catching mice to keep his job Aside from the way the mice dart about there are several large jars stored in the larder which Caesar must try not to break

One of the several features that gave the Commodore 64 version of the game its appeal was the sheer beauty of the graphics — large colourful and realistic (in a cartoon sort of way) The Spectrum version cannot quite match the original, simply because of the hardware's limitations, but nevertheless the graphics are still large and realistic, matching anything seen from Ultim
Marvellous

Program *Caesar The Cat*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Mirrorsoft*
Holborn Circus
London EC1P 1DQ

objects corrupted by Klartz which must be redeemed and brought back to the light

This involves retrieving them from their zones and placing them together in a suitable place for them to receive the Power of Light Presumably God, or even Wagner, descends and blesses them or something

However, facetiousness apart, this is the best adventure I've ever seen for the Dragon — it's complex and entirely machine code Expect to be up all night

Program *Klartz & The Dark Forces*
Price *£9 95*
Micro *Dragon 32*
Supplier *Dungeon Software, Milton House, St John Street, Derbyshire DE6 1GH*

IN TRAIN

Midnight Express is a train orientated program for the Commodore 64 In fact, train obsessed might be a better way of putting it

The plot is very complicated and is divided into three sections In the first, you are a man who turns into a carriage and tries to join onto a train circling a track In the next, you try and reduce the number of carriages to prevent the train from bumping into itself — mad railmen are constantly adding carriages to the track Finally, you have to rescue various parcels that are strewn on the track from the mad rush of an oncoming train

The game is mostly in machine code and consequently the action is fast and furious An original concept too

Program *Midnight Express*
Price *£7*
Micro *Commodore 64*
Supplier *Camille Software, 4 Marennes Crescent, Brightlingsea, Colchester CO7 0RX*

RUSTIC

Bubble Bus has done some good software in the past for the Commodore 64 Its latest title is *Flying Feathers* and is rustic in theme

You are a game keeper whose regrettable task it is to sit in a freezing boat in the middle of a lake preventing various eagles from grabbing fish This involves shooting at them

Other than that there isn't much to say, the graphics are excellent as is the sound track Apparently the game utilises 10 sprites rather than the supposed maximum of 8 Bubble Bus's new games are priced at £6 99 which is a couple of pounds lower than the norm — let's hope it's the beginning of a trend

Program *Flying Feathers*
Price *£6 99*
Micro *Commodore 64*
Supplier *Bubble Bus Software, 87 High Street, Tonbridge, Kent TN9 1RX*

CRASH DIVE

Yet more ZX81 programs! *Sea Wolf* is the latest and it comes from Stephen Hartley Computing — a company I've not heard of before

The game involves stalking and eventually sinking a target ship with your submarine. There are both periscope and sonar displays and a large number of command keys. As a game, it has far more in common with *Flight Simulation* than *Space Invaders*

The ship can respond to your attack with depth charges requiring an immediate crash dive — it's exciting stuff

Program *Sea Wolf*
Price *£3 95*
Micro *ZX81 (16K)*
Supplier *Stephen Hartley Computing, 16 Park Road, Coventry CV1 2LD*

FREUDIAN

If you are bored with cosmic battlecruisers aliens and mega destruction, how about trying self sacrifice? In *Nursery Nightmare* your unending task is to pacify a crying baby by grabbing bottles of milk scattered about his nursery

This seemingly simple objective is made difficult by the hostile nature of the baby's toys which seek to block your path There are five screens of increasing difficulty and a baby whose oral fixation would surprise even Freud Its machine code and the graphics are amusing

Program *Nursery Nightmare*
Price *£7 50*
Micro *Commodore 64*
Supplier *Cable Software, 52 Lumbry Road, Luton, Beds LU3 2PL*

INTRIGUING

Cosmic Bounce is a far more ingenious game than its name suggests While trying to wipe out assorted Doovries with your plasma cannon, you must also protect your energy source in mid screen Since the energy source can be hit by both the Doovries, and your own rocket and plasma bolts, this is no simple task

The graphics are however fairly basic — in fact, once your rocket is whizzing round the screen it more resembles a bluebottle than a plasma canon Sound effects, too, are of a standard "boom-boom" type But, for all that the game is utterly addictive

Program *Cosmic Bounce*
Price *£7 50*
Micro *Commodore 64*
Supplier *Cable Software, 52 Lumbury Road, Luton, Beds, LU3 2PL*

ADRENALIN

Star Commando is a 'zap the aliens' game for the Commodore 64 with enough new features to make playing it worthwhile

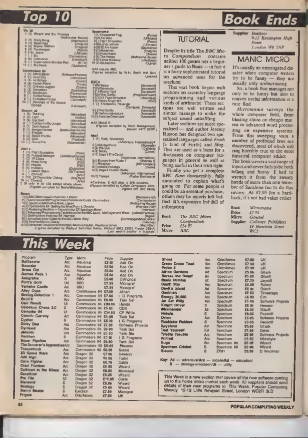
Aside from laser cannons and hordes of baddies there is a sort of *Star Trek* element to the game You have maps of the universe divided into different segments and you have to warp back and forth looking for baddies and, from time to time, your Mothership

Actually the fuel supply runs out rather quickly and finding the Mothership is the most nerve wracking adrenalin inducing part of the game

The graphics are well done and each group of aliens moves in a different way Another good Commodore game from Terminal

Program *Star Commando*
Price *£7 95*
Micro *Commodore 64*
Supplier *Terminal Software, 28 Church Lane, Prestwich, Manchester*

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases, Popular Computing Weekly, 12 13 Little Newport Street WC2H 3LD



Top 10

Vic 20
1 (2) Wizard and the Princess (Melbourne House)
2 (3) Krazy Kong (Interceptor)
3 (4) Bewitched (Imagine)
4 (9) Wacky Waiters (Imagine)
5 (6) Paratrooper (Rabbit)
6 (10) Jetpac (Ultimate)
7 ( ) Blitz (Commodore)
8 (8) Gridrunner (Llamasoft)
9 (–) Superwatzer/Bomber Run (K-Tel)
10 (–) Sky Hawk (Quicksilva)

Commodore 64
1 (1) Manic Miner (Software Projects)
2 ( ) Siren City (Interceptor)
3 (4) Mr Wimpy (Ocean)
4 (8) Falcon Patrol (Virgin)
5 (3) Chinese Juggler (Ocean)
6 (2) Stingray (Quicksilva)
7 (5) Megawarz (Paramount)
8 ( ) Vortex Raider (Interceptor)
9 (–) Forbidden Forest (Centresoft)
10 (–) Revenge of the Mutant Camels (Llamasoft)

Dragon 32
1 (8) The King (Microdeal)
2 (2) Ugh! (Softek)
3 (9) Eightball (Microdeal)
4 ( ) Cuthbert in the Jungle (Microdeal)
5 (7) Devil Assault (Microdeal)
6 (1) Hungry Horace (Melbourne House)
7 (–) Frogger (Microdeal)
8 (5) Space Shuttle (Microdeal)
9 (3) SAS (Peaksoft)
10 (–) Grand Prix (Salamander)

ZX81★
1 (1) Flight Simulation (Psion)
2 (3) Football Manager (Addictive Games)
3 (2) 1K Chess (Artic)†
4 (8) Krazy Kong (PSS)
5 (6) Hopper (PSS)
6 (4) Invaders (Quicksilva)
7 ( ) Meteor Storm (DK'Tronics)
8 ( ) ZX Forth (Artic)
9 (10) ZX Disassembler-Debug (Bug Byte)
10 (–) Chess 2 (Artic)
† 1K only ★ All 16K except where shown
(Figures compiled by Boots/Websters)

Spectrum★
1 (1) Chequered Flag (Psion)
2 (2) Atic Atac (Ultimate)
3 ( ) Flight Simulation (Psion)
4 (6) Lunar Jetman (Ultimate)
5 (3) 3D Ant Attack (Quicksilva)
6 (7) Alchemist (Imagine)
7 (5) Hunchback (Ocean)
8 (9) The Hobbit (Melbourne House)
9 (8) Cyrus IS Chess (Intelligent)
10 (4) Scuba Dive (Durell)
★All require 48K.
(Figures compiled by W.H. Smith and Son, London)

BBC★
1 (8) Hopper (Acornsoft)
2 (2) Planetoids (Acornsoft)
3 (1) Rocket Raid (Acornsoft)
4 (3) Killer Gorilla (Program Power)
5 (7) 747 Flight Simulator (Microdeal)
6 (5) White Knight MK (BBC)
7 ( ) Transistor's Revenge (Computer Concepts)
8 ( ) Disc Gorilla (Acornsoft)
9 (6) Sphinx Adventure (Acornsoft)
10 ( ) Starship Command (Acornsoft)
★All Model B
(Figures compiled by Micro Management, Ipswich 0473 59181)

Atari
1 (†) Rally Speedway (Adventure International)★
2 ( ) Savage Pond (Starcade)
3 (4) Warlock (Calisto)‡
4 (8) Slinky (Cosmi)
5 (6) Saga 5 The Count (Adventure International)
6 (5) Escape from Pulsar 7 (Channel 8)
7 (–) Wingman (Microscope)§
8 ( ) Aztec Challenge (Cosmi)
9 (3) Saga 4 Voodoo Castle (Adventure International)
10 (2) Popeye (Parker Brothers)★
★Cartridge § 48K disc. ‡ 32K cassette.
(Figures compiled by Calisto Computers, Birmingham 021 632 6458)

Books
1 (1) BBC Micro Disc Companion, *Latham* (Prentice-Hall)
2 ( ) Commodore 64 Programmers Reference Guide Commodore (Commodore)
3 (5) Spectrum Microdrive Book, *Logan* (Melbourne House)
4 (7) Commodore 64 Getting the Most From It, *Onosko* (Prentice-Hall)
5 (3) Mastering Machine — Merson your ZX Spectrum *Baker* (Interface)
6 ( ) Advanced Programming Techniques for the BBC Micro, *McGregor and Watts* (Addison Wesley)
7 ( ) Getting More from your 64 *Hamann* (Sigma)
8 ( ) Advanced User Guide for the BBC Micro *Bray* (Cambridge Micro Centre)
9 (9) Forth for Micros, *Oakey* (Newnes)
10 (6) Advanced Graphics with the BBC Microcomputer, *Angell and Jones* (Macmillan)
(Figures compiled by Watford Technical Books, Watford 0923 23924 Prestel 26844)
(Last week's position in brackets)

Book Ends

TUTORIAL

Despite its title The *BBC Micro Compendium* contains neither 100 games nor a beginner's guide to Basic — in fact it is a fairly sophisticated tutorial on advanced uses for the machine

This vast book begins with sections on assembly language programming and various kinds of arithmetic These sections are well written and almost manage to make the subject sound unbaffling

Later sections are more specialised — and author Jeremy Ruston has designed two specialised languages called *Froth* (a kind of Forth) and *Slug*. These are used as a basis for a discussion on computer languages in general as well as being useful in their own right

Finally you get a complete BBC *Rom* disassembly, fully annotated to explain what's going on For some people it could be an essential purchase, others may be merely left baffled It's expensive but full of information

Book *The BBC Micro Compendium*
Price *£14 95*
Micro *BBC*
Supplier *Interface 9-11 Kensington High Street London W8 5NP*

MANIC MICRO

It's usually an unmitigated disaster when computer writers try to be funny — they are usually only embarrassing

So, a book that manages not only to be funny but also to convey useful information is a rare find

Micromania surveys the whole computer field, from blasting aliens on cheapo micros to advanced word processing on expensive systems From this sweeping vista a number of profound laws are discovered, most of which will ring horribly true to the most fanatical computer addict The book covers a vast range of topics and never fails to be both telling and funny I had to wrench it from the sweaty hands of more than one member of Sunshine Inc to do this review At £7 95 for a hardback, it's not bad value either

Book *Micromania*
Price *£7 95*
Micro *General*
Supplier *Gollancz Publishers 14 Henrietta Street WC2*

This Week

Program	Type	Micro	Price	Supplier
Battlezone	Arc	Aquarius	£5 95	Add On
Bounder	Arc	Aquarius	£5 95	Add On
Break Out	Arc	Aquarius	£5.95	Add On
Games Pack 1	Arc	Aquarius	£5 95	Add On
Anagrams	S	BBC	£3.95	Cylindrical
Flint's Gold	Ad	BBC	£7.95	Micrograf
Vampire Castle	Ad	BBC	£7.95	Micrograf
Alley Oops	Arc	Commodore 64	£7.95	Alman
Beding Galactica 1	Arc	Commodore 64	£7.50	I G Programs
Besera	Arc	Commodore 64	£6.90	Task Set
Calc Result	Ut	Commodore 64	£49.95	Handic
Colossus Chess 2.0	S	Commodore 64	£5 [illegible]	CDS
Compiler 64	Ut	Commodore 64	£34 50	CP White
Cosmic Convoy	Arc	Commodore 64	£5.95	Task Set
Cypher	S	Commodore 64	£5 00	I G Programs
Dinky Doo	Arc	Commodore 64	£7.95	Software Projects
Gyroped	Arc	Commodore 64	£6 90	Task Set
Jammin	Ut	Commodore 64	£5 50	Task Set
Pentoon	S	Commodore 64	£3 [illegible]	I G Programs
Super Pipeline	Arc	Commodore 64	£6.90	Task Set
The Sorcerer's Apprentice	Arc	Commodore 64	£9.95	Phoenix
Troopatruck	Arc	Commodore 64	£6.99	Rabbit
3D Space Wars	Arc	Dragon 32	£7 [illegible]	Hewson
Add High	Arc	Dragon 32	£6 [illegible]	Tudor
Cave Fighter	Arc	Dragon 32	£6.75	Cable
Crazi Plumber	Arc	Dragon 32	£6 95	Wizard
Cuthbert in the Mines	Arc	Dragon 32	£8.00	Microdeal
Decathlon	Arc	Dragon 32	£6.95	Wizard
Pro File	Ut	Dragon 32	£15.95	Cable
Starword	S	Dragon 32	£6.95	Wizard
Strategy	S	Dragon 32	£5 45	Wizard
Sword Master	S	Electron	£7.95	Micrograf
Frigate	Arc	Oric/Atmos	£7.95	UK
Ghost	Arc	Oric/Atmos	£7.50	UK
Green Cross Toad	Arc	Oric/Atmos	£7 50	UK
Probe 3	Arc	Oric/Atmos	£7.90	UK
Africa Gardens	Ad	Spectrum	£5 [illegible]	Gilsoft
Barsak the Dwarf	Ad	Spectrum	£5.95	Gilsoft
Basic Utilities	Ut	Spectrum	£7.25	Jaysoft
Death Star	Arc	Spectrum	£6.95	Rabbit
Devil's Island	Ad	Spectrum	£5 [illegible]	Gilsoft
Gustman	Arc	Spectrum	£5 50	Timescape
Energy 30,000	Arc	Spectrum	£4 90	Elm
Jet Set Willy	Arc	Spectrum	£5 95	Software Projects
Knight Driver	S	Spectrum	£6 [illegible]	Hewson
Windbender	Ad	Spectrum	£5.95	Gilsoft
Nebula	S	Spectrum	£6.95	Rabbit
Orion	Arc	Spectrum	£5 95	Software Projects
Robbister Raiders	S	Spectrum	£5 95	Redshift
Spyplane	Ad	Spectrum	£5.95	Gilsoft
Test Yourself	Ed	Spectrum	£7.95	Dalek
Tribble Trouble	Arc	Spectrum	£5 95	Software Projects
Wilfred	Arc	Spectrum	£5 50	Microbyte
Bugs	Arc	Spectrum 48	£5 95	Wizard
Spectrum Cricket	S	Spectrum 48	£5 90	Wizard
Stocks	S	ZX81	£3.95	D Woolman

Key: Ad — adventure/Arc — arcade/Ed — education/ S — strategy-simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week All suppliers should send details of their new programs to This Week Popular Computing Weekly 12-13 Little Newport Street, London WC2R 3LD

Ziggurat



Software piracy rampant

Two years ago piracy in the video industry, was rampant Nearly every video retailer stocked at least one product that was either a back to back copy he had made himself bought at a very low cost or a cheap off the back of a lorry couterfeit or was material that had not yet been officially released on video

Most dealers did not feel that they were doing anything wrong — they were simply supplying what the public wanted with product that protected their margins This attitude was reconfirmed by the derisory penalties received by the handful of dealers who were prosecuted — in general a maximum of £50 fine

The video companies were bothered about piracy but were not willing to spend any money on long term solutions while business remained good and the market appeared to continue to grow It was only when sales dried up that they realised that their livelihood was in danger and that they would have to invest in legal and legislative action if they were to stay in business

Exactly the same thing is now happening to computer software Although the number of dealers involved in product of a dubious nature is still much smaller, the software companies are beginning to notice the number of sales they are losing Even the bigger companies are feeling the pinch

The Guild of Software Houses is becoming increasingly active in the battle against the software thieves pursuing action on a number of fronts — some of which would be impossible to discuss without hampering the possible effect of the action Many Government bodies are only too happy to help in protecting the industry s long term interests But it is not enough to secure conviction under existing law because the penalties are not adequate so the difficult problem of legislating change must also be dealt with

A large number of computer industry groups are now pooling their resources to try to secure suitable protection for software houses by seeking amendments to the 1956 Copyright Act The Government has already anounced its intention to rewrite this legislation in order to bring it into line with the latter part of the twentieth century but seems singularly inactive in doing so

In the mid 1970s it set up the Whitford Committee to look at copyright reform — it reported its findings in March 1977 There then followed a lull of four years when the Government published a Green Paper the equivalent of a discussion document There has been much discussion since but still no action

One of the problems the Government faces is how restrictive copyright should be Looking at games software for example — if one company has brought out a maze game should all other companies be prevented from doing so? How similar can different games be without infringing one another s copyright? Should game copyright extend over all hardware formats regardless of whether the first company has any interest in putting its game out on other formats?

The difficulty comes in drawing the line If the same standards could be applied as for literature then it would still be possible to develop a game type without copyright infringement as long as an author is developing rather than simply ripping off a theme

But the problem remains will Judges — unable to distinguish *Culture Club* from, say *The Beatles* — be able to rule upon obvious points of difference between games like *Zaxxon* and *Falcon Patrol*?

Nick Alexander

Puzzle

At odds

Puzzle No 99

"Every even number can be formed by adding together two odd number primes — counting 1 as a prime Professor Hex paused to allow his students time to write this down.

"For example " he continues, "four is the sum of three and one Some even numbers may be formed in more than one way To illustrate this he wrote on the blackboard 5+3=8 and 7+1=8

Can you tell me he continued in the range of even numbers from 2 to 100 which number or numbers can be formed in the most possible ways?

Can you work it out?

Solution to Puzzle No 94

The program calculates all squares that are equal to one less than the sum of two identical smaller squares

```
10 LET A = 1
20 LET T = (2 * A * A) - 1
30 LET S = SQR (T)
40 LET S = VAL STR$ S
50 LET S = INT S THEN PRINT A
60 LET A = A + 1
70 GOTO 20
```

There are an infinite number of these possible but the first few numbers (representing the sides of the smaller squares) are 1 5 29 169 and 985 Of these only the answer given is in the correct range implied in the question

The smaller tables each had 29 x 29 tiles on them making 1682 tiles in all If one tile is broken the remaining 1681 tiles can be re-formed into a 41 x 41 arrangement

Winner of Puzzle No 94

The winner is H Hudson Leyton Crescent Bradford W Yorks who receives £10

I've ironed out the Bugs in your Space Shuttle program son. now you wont keep losing space satellites, Heat panels etc

What did you do that for dad ? Now its nothing like the Real thing


But seriously AUTOMATA
PIMANIA
GROUCHO
PI EYED
PI BALLED
MORRIS MEETS THE BIKERS
YAKZEE
GO TO JAIL
THE PIMAN'S GREATEST HITS
OLYMPIMANIA – He's back! He's going for gold
I ENCLOSE THE RIGHT MONEY, OR DEBIT MY ACCESS/VISA CARD
CARD NUMBER
MY SIGNATURE
MY NAME
MY ADDRESS
POST CODE
NO EXTRAS! ALL OUR PRICES INCLUDE DELIVERY AND V.A.T.
Send to AUTOMATA U.K. LTD
27 Highland Road, Portsmouth, Hants. PO4 9DA
24-Hour Credit Card Hotline (0705)735242
BABY CLAIR AND UNCLE GROUCHO LOITER BY THE POOL AS THEY WAIT FOR THE PIMAN, WHOSE NEXT OLYMPIMANIACAL EVENT IS THE BUTTERFL...
AH! I HEAR THE SPLAP-SPLAP-SPLAP OF UNSHOD FEET...
COR, THIS WATER'S LIKE ICE! DON'T TELL HIM, THOUGH. HE'S ONLY PRACTISED IN THE BATH-TUB SO FAR...
AH, YES – THE MAN FROM ATLANTIS!
HI THERE, YOU GUYS
AAAIIEEE
THAR SHE BLOWS
WAIT FOR IT
WHEEEEE
SPLUNGE
OH COME ON IT'S NOT THAT COLD, IS IT?
YES IT IS – AND MOREOVER I'VE BEEN STUNG BY A JELLYFISH!
WHAT FLAVOUR?
COME ON THEN. START SWIMMING ABOUT. WHAT DO YOU THINK YOU'RE HERE FOR, A GAME OF CHESS?
I'M NOT GOING ON WITH THIS JELLYFISH IN THE POOL INDEED! WHATEVER NEXT?
AHEM
WHAT'S THIS? "AL E GATOR PROFESSIONAL AQUATICS EVENT CANDIDATE INCENTIVE" EH?
RIGHT
JOIN THE PIMANIACS
I CHASED THE BRIGHT, ELUSIVE BUTTERFL OF LUNCH...
SEELLP
WOW 2 1/2 LENGTHS OF THE POOL WELL DONE...
AL'S WORKED HARD TOO GROUCHO, THROW HIM A CABINET MINISTER!
GASP...
THERE WAS A SHARK IN THERE TOO... A HAMMERHEAD SHARK!
HAMMERHEAD SHARK, EH? HEY GROUCHO – MAKE THAT 2 CABINET MINISTERS AND A TIN OF OINTMENT!
NEXT... WEIGHTLIFTING
I THINK YOU SHOULD SAVE THE WEIGHTLIFTING TILL LAST I MEAN YOU'VE ONLY GOTTA SNAP SOMETHING, AND...
AND I'M OUT OF IT ALTOGETHER! WELL, I HAVE HOPES
FLEX FLEX
TCHAH!
'SCUSE! EVANS HERE! I WAS ASKED TO SAY THANKS TO ALL OF YOU WHO SENT IN PROGRAMS TO HELP US SPREAD PEACE AND JOY ACROSS THE PLANET, AND...
MEMO
TCHAH! BEAT IT! AAAGH!
ALSO THANKS TO WEBSTERS THE SOFTWARE WHOLESALERS FOR DISTRIBUTING OUR PRODUCTS!
GRRR
HELP! MAD PIMAN ON THE RAMPAGE
SORRY – NO OUTRO – GOTTA DASH